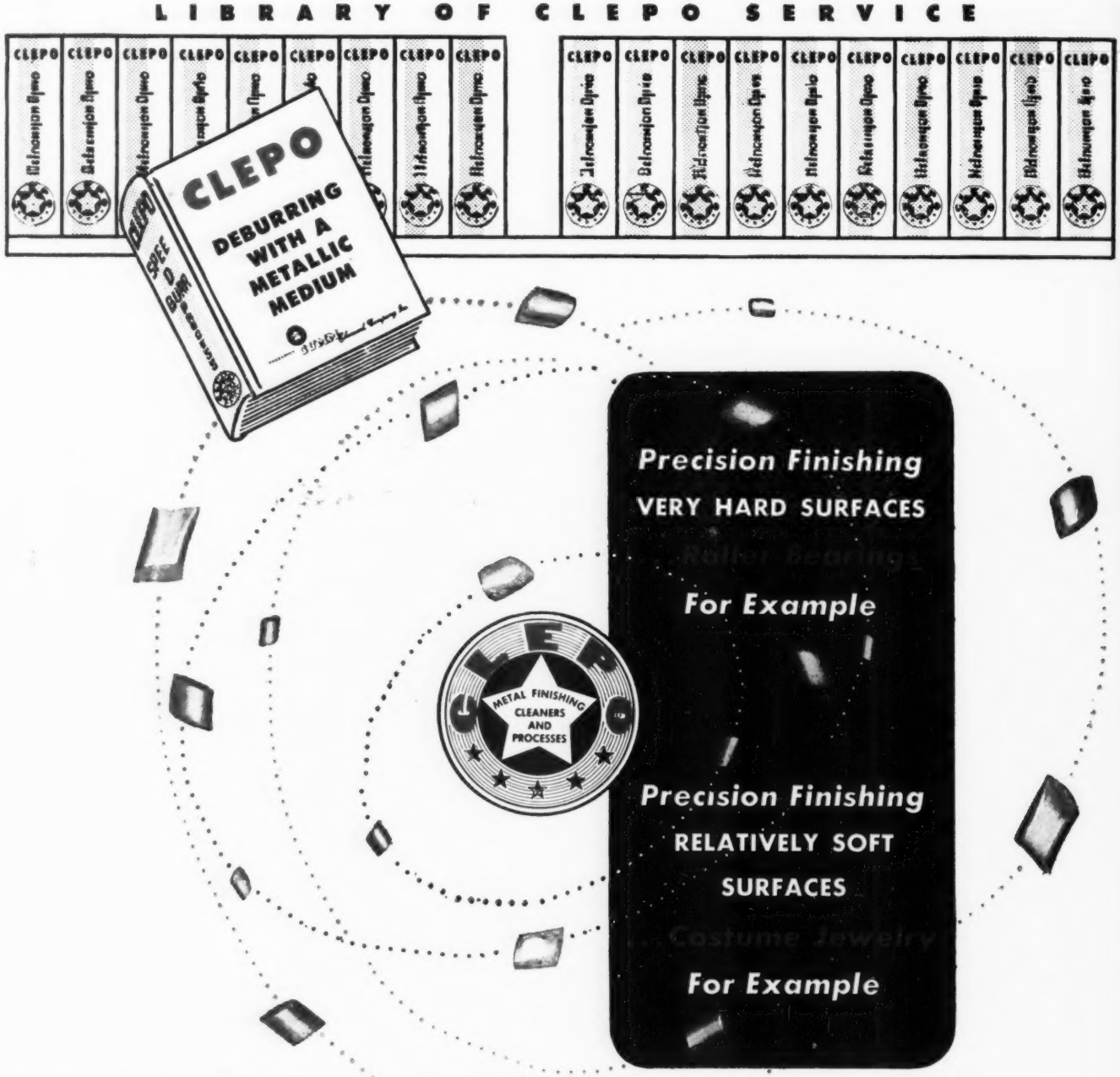
August, 1956

METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

FOUNDED 1903



The CLEPO Spee-D-Burr Process can do both. It's exceptionally versatile. Using uniformly-sized zinc barrel-shaped slugs, this process produces a rather unique tumbling action. Contacts are surface to surface rather than point or edge to surface as is usually the case with non-metallic deburring media. Tendency to scratch, gouge or otherwise mar the surface is eliminated. Uniform high polish precision finishes can be obtained over a wide range of metal hardness — in one operation where the steels are concerned; followed by a ball burnishing operation on the non-ferrous metals.

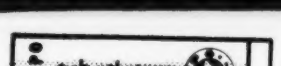
Spec-D-Burrs come in three sizes: 1/8, 1/4, 3/8 inches. You select the size that will not jam in slots or recesses.

The next time our Field Service man calls ask him to show you samples of these Spee-D-Burrs and to tell you more about this CLEPO Process. It may offer the solution to your barrel finishing problem. And don't forget he has other tumbling processes and materials as well as cleaners, strippers, etc., that might fit into other phases of your operations.

CLEPO SERVICE is based on more than twenty-five years of close contact with finishing plant problems. Many different formulations are available for cleaning, stripping, burnishing, deburring, and for producing special finishes.

FREDERICK GUMM *Chemical Company Inc.*

538 FOREST STREET, KEARNY, N.J.



Metal Finishing is published monthly by the Finishing Publications, Inc., 381 Broadway, Westwood, New Jersey, U.S.A.
Entered as second class matter at the Post Office in Westwood, N. J. Volume 54, No. 8, August, 1956. Four Dollars Per Year.

FOR PRECISION STOPS . . .

IN SELECTIVE PLATING . . .

MICCROSTOP

. . . is designed to achieve an accurate line of demarcation in all plating cycles. It will go through cleaners and hot solutions without losing its exceptional adhesion, unsurpassed on sharp edges. The finest all purpose stop-off lacquer on the market today.

MICCROMASK

. . . is specifically designed for maximum adhesion in hard chrome plating. It will hold to a fine line and may be easily removed after plating. Dries rapidly. Multiple coats will take any long cycle without treeing.

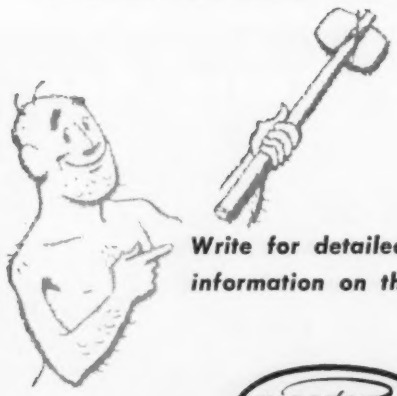
Note: Both MICCROSTOP and MICCROMASK may be removed easily in MICCROSTRIP A.

MICCROWAX

. . . C-562 is the outstanding product for the most efficient method of selective hard chrome plating. Melting at 180°F, it is especially applicable for flat surfaces and sharp edges, where dipping is feasible.

. . . C-600 will take all plating cycles without losing adhesion. Melting at 300°F, it is not affected by temperatures, acids, or caustics used in any plating operation.

Both MICCROWAX C-562 and C-600 may be reused. Only one dip tank is required. Both harden immediately, cutting down application time to a minimum.



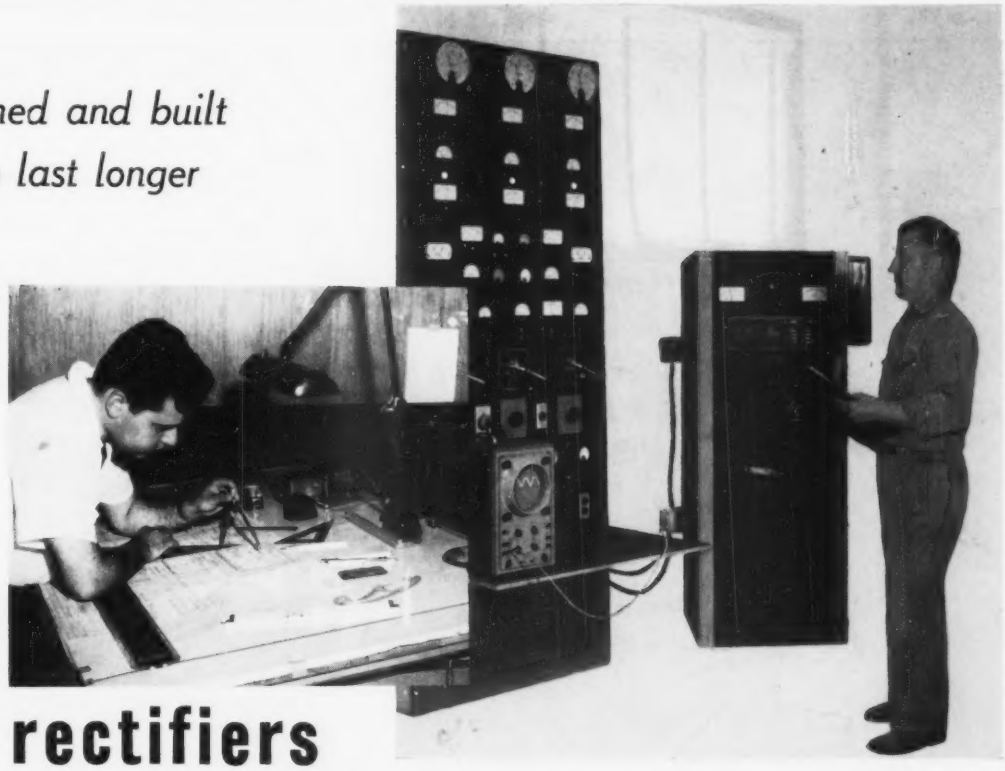
Write for detailed bulletins giving full information on the above products.

MICCRO Products

MICHIGAN CHROME
and Chemical Company
8615 Grinnell Avenue • Detroit 13, Michigan

MET

Designed and built to last longer



RAPID rectifiers are fully tested to make sure.

In a standard test procedure, factors, such as efficiency, overload protection, and regulation, are thoroughly checked to make sure rectifier operation performs within original rigid design specifications.

- **EFFICIENCY TEST**
  Unit efficiency, (ratio of output d.c. wattage to input a.c. wattage) is measured by using various loads to simulate actual plating conditions.

- **OVERLOAD TEST**
  In this test the unit is subjected to 100% current overload for 30 seconds at a time, at three minute intervals for two hours.

  25% current Overload Test
  A load 25% over the rated capacity of the rectifier is steadily imposed for a two hour period. Load again simulates plating conditions.

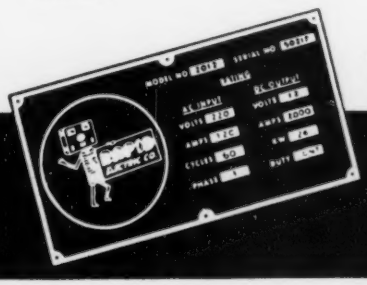
  Voltage Overload
  This test simulates over-voltage line surges of up to 25% above rated line voltage in rectifiers with no current being drawn. The ability to withstand voltage overload is thereby determined.

- **PHASE PROTECTION TEST**
  Three phase rectifiers are tested to check the operation of the phase protection circuit breaker in the event one of the input phases is interrupted. Overloading of the other two phase circuits is fully protected by immediate unit shutdown.

- **VOLTAGE REGULATION TEST**
  D.C. voltages are checked at no load and at full load to determine power unit stability. Steady voltage at the plating tank is thereby assured regardless of varying loads.

- **TRANSFORMER SECONDARIES**
  A.C. current to each stack is checked and balanced to within 0.5% of entire current range. Excessive loading is thereby curtailed while detecting excessive unbalance in the transformer.

- **RIPPLE VOLTAGE**
  The amount of permissible output ripple voltage of each phase, in a 3 phase rectifier is tested by providing a standard, individually balanced input voltage and current in each of three phases.



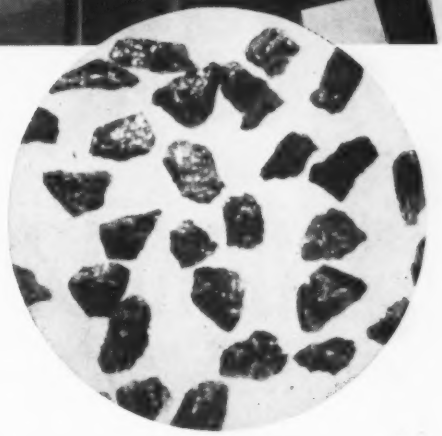
THE NAMEPLATE THAT MEANS *"More Power to You!"*

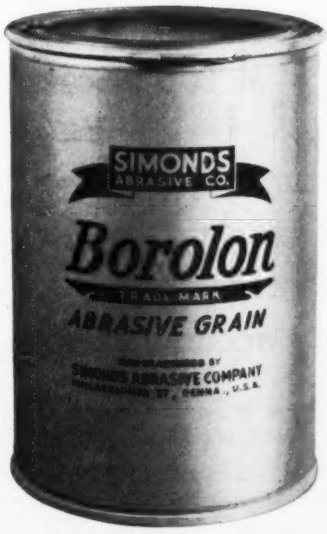
RAPID ELECTRIC COMPANY

2889 Middletown Road • New York 61, N. Y. • Phone: Talmadge 8-2200

Controlled Shape

for superior polishing





Rigidly tested for controlled grain shape, Borolon assures uniformly excellent results on heavy duty polishing jobs. This hard, sharp, tough crystalline aluminum oxide grain has a blocky shape with each particle dense and solid with well defined cutting edges. Easy to set-up. Packs readily and does not "walk away" from the head. Full range of sizes. Packed in tightly sealed fibre containers. For information on how to use Borolon on set-up wheels, write for free bulletin ESA—198

SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Factory Branches in Boston, Chicago, Detroit, San Francisco and Portland, Oregon.
Division of Simonds Saw and Steel Co., Fitchburg, Mass.

Whether it's a carload
or a handful, you're

ON THE RIGHT TRACK

when you ship us your

NICKEL PLATER'S SCRAP

We're always in the market
at top prices

*For prompt quotation
send us a 5-lb.
representative sample
of your accumulation*

Invoice us for sample . . . or we will pay on basis of laboratory analysis.

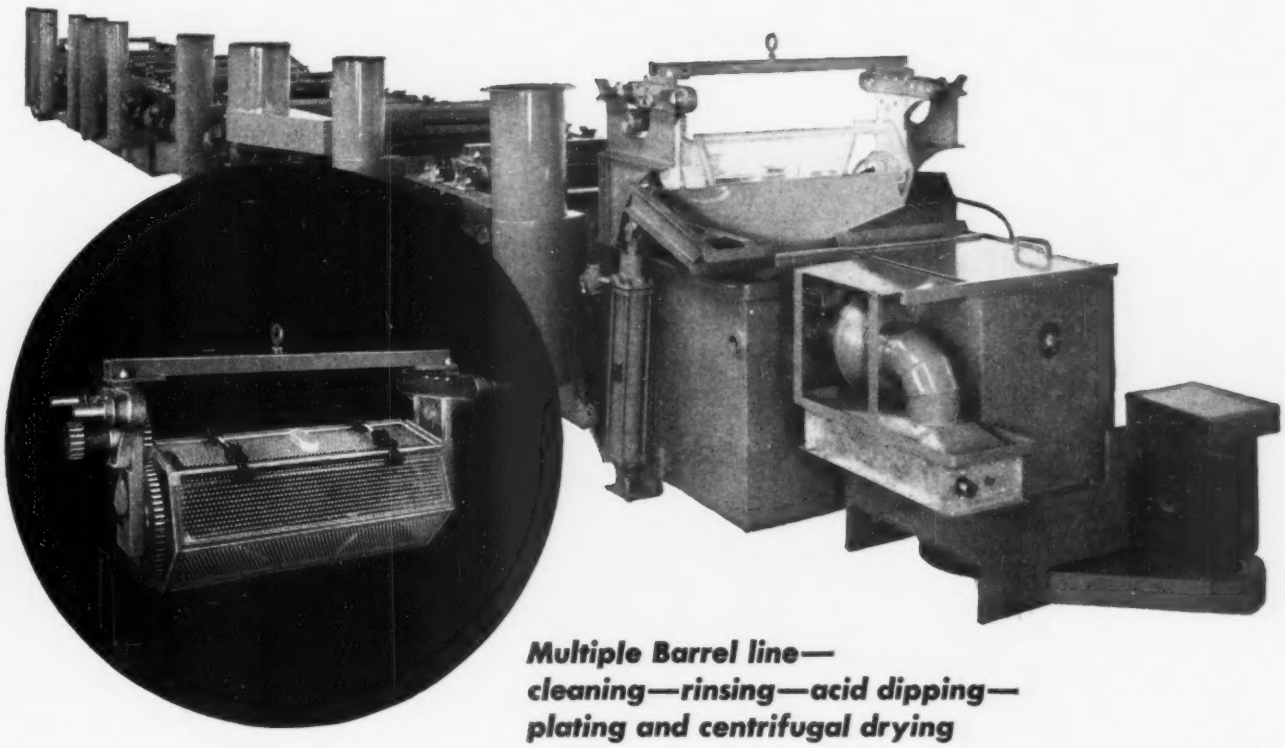
Phone . Wire . Write

Stainless Steel Corp. of America

OHIO EDISON BLDG. YOUNGSTOWN 3, OHIO

RIverside 4-4123

CROWN PLATING BARRELS



Multiple Barrel line—
cleaning—rinsing—acid dipping—
plating and centrifugal drying

CROWN LUCITE CYLINDERS

Can be operated through the entire cycle
cleaning—rinsing—acid dipping—and plating solutions.

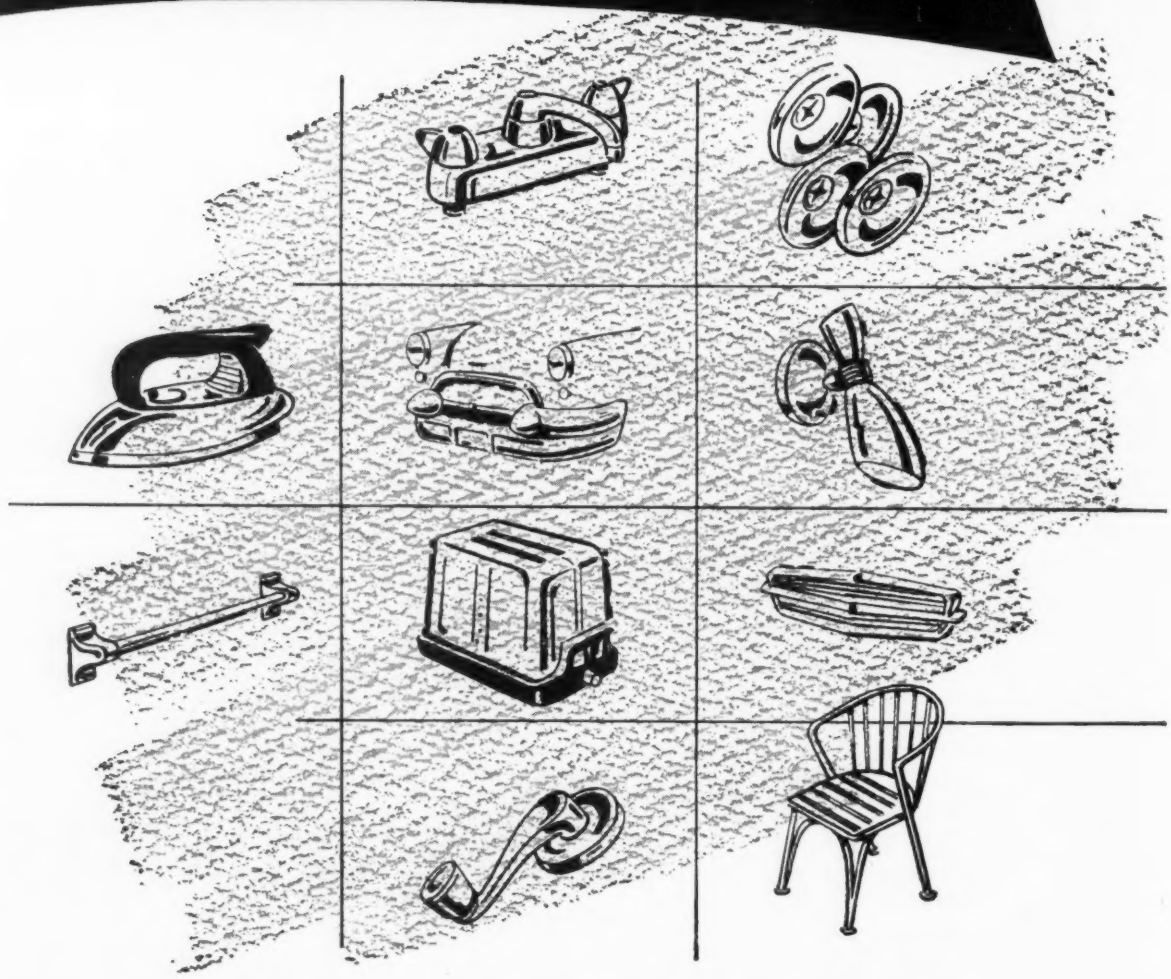
Whether your production requires a single barrel
or a multiple set up for cleaning, rinsing, acid dipping, and
plating, there are Crown barrels to fit the job.

Write for complete details

CROWN RHEOSTAT AND SUPPLY COMPANY
3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

HARSHAW Nubrite

long, bright nickel plating operation without treatment



Other outstanding advantages are:

BRIGHT OVER WIDE RANGE
from a few amperes/ft.^{2}
to well over 100 amperes/ft.^{2}

HIGH TOLERANCE to common impurities

HIGHLY RECEPTIVE to chrome

EXCELLENT LEVELING

BETTER BRIGHTNESS with thinner deposits.

SIMPLE OPERATION and CONTROL
Plates brightly from 120°F to 155°F.
pH can vary over a wide range
Liquid addition agents.

REMAINS DUCTILE AFTER LONG OPERATION

For additional information contact the Harshaw office nearest you.

THE HARSHAW CHEMICAL CO.

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Chicago 32, Ill. • Cincinnati 13, Ohio • Cleveland 6, Ohio • Houston 11, Texas
Los Angeles 22, Calif. • Detroit 28, Mich. • Philadelphia 48, Penna.
Pittsburgh 22, Penna. • Hastings-On-Hudson 6, N. Y.

ARE YOU PAINTING WITH APPLESAUCE?

Corrosive fumes and gases play havoc with "unprotected" structural steel or concrete walls and factory equipment. But the selection of a satisfactory protective coating isn't always easy. A coating that adequately protects against fume "A" may fail in a week against fume "B."

Corrosion engineers know there is no "all purpose" protective coating. Wisely they steer clear of products whose makers claim universal "acid and alkali" resistance. They have learned through bitter experience that all too frequently they end up "painting with applesauce."

The fact that Tygon Paints—first marketed in 1939—have grown increasingly popular with corrosion engineers, stems from two things:

1. They are GOOD PROTECTIVE COATINGS

2. WE'RE NOT AFRAID TO ADMIT THEIR LIMITATIONS

Used as they should be used and under conditions for which they are suitable, Tygon Paints will out-perform and outlast practically any coating on the market. Seventeen years have proved it.

323E

WRITE FOR THIS FREE PAINTING MANUAL

Tells how and where to use Tygon Paint . . . what primers to use to obtain best adhesion to various surfaces; how to make sure you're going to get adequate protection at minimum cost. Address The U. S. Stoneware Co., Plastics & Synthetics Division, Akron 9, Ohio.

Plastics & Synthetics Division

U. S. STONEWARE

AKRON 9, OHIO

LOWER YOUR COSTS IN PLATING

THE FINISHING TOUCH

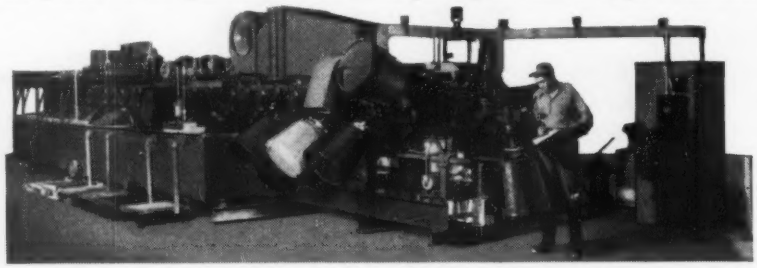
by Guy A. Cummings
Metal Finishing Sales Manager
FREDERIC B. STEVENS, INC.

How Modern Equipment Can Improve Your Operations

Judging from the vast number of quotations on automatic equipment for electroplating, anodizing and processing being made each month at Stevens, we know the interest in automatic equipment has never been higher. To meet competitive prices, improve finishes and lower labor costs, metal finishers are constantly challenged to make modern improvements in their operations. Usually this means more modern equipment.

Let us tell you how the Stevens Automatic Barrel Plating Machines can help you. They are used for zinc, cadmium, nickel, brass plating of such small parts as screws, bolts, nuts and stampings, and also a wide variety of bulk immersion processes such as phosphatizing, washing, pickling, and chromating.

We have been making these machines for a long long time—hundreds are in operation—so you can be confident that there are no mechanical bugs. They are simple to operate—feature automatic unloading—and when equipped with automatic load devices, several machines can be operated by only one man. The cylinders which take the parts to be plated are the oblique open ended type—without



covers. By raising or lowering the cylinder the parts slide in and out without the necessity of unclamping and removing covers normally needed for horizontal type cylinders.

The Stevens simple compact design makes it economically feasible to purchase production capacities as high as 4000 pounds per hour in one machine, or just as practical to distribute the capacity between two or more machines to provide flexibility in plating thickness, production, etc.

Here are other advantages in using Stevens Automatic Barrel Machines—uniformity of deposit, fewer rejects, better working conditions, easier chemical control, better scheduling and delivery and *lower costs per piece.*

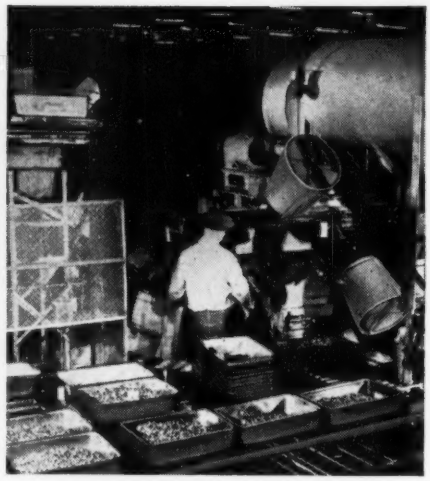
The selection of the right equipment, the capital investment required, the arrangement of your plant to install the equipment are important considerations. Frederic B. Stevens, Inc., with its long experience in the metal finishing field has made many analyses of this kind. We can help you too.

Write to Frederic B. Stevens, Inc., 1808 18th Street, Detroit 16, Michigan.

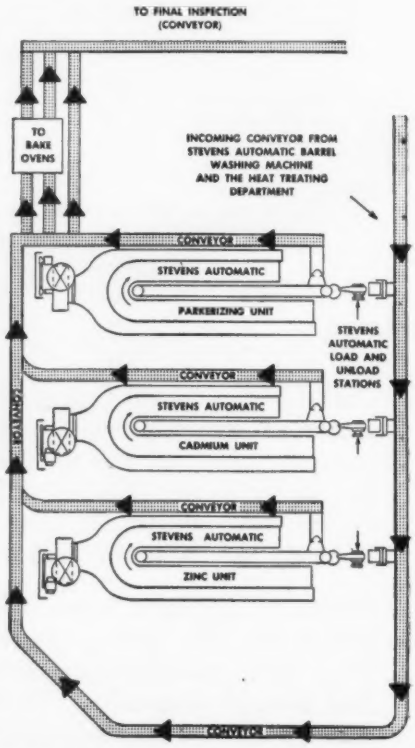
FREDERIC B. STEVENS INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

METAL FINISHING EQUIPMENT AND SUPPLIES FROM CASTINGS OR STAMPINGS TO FINISHED PRODUCT

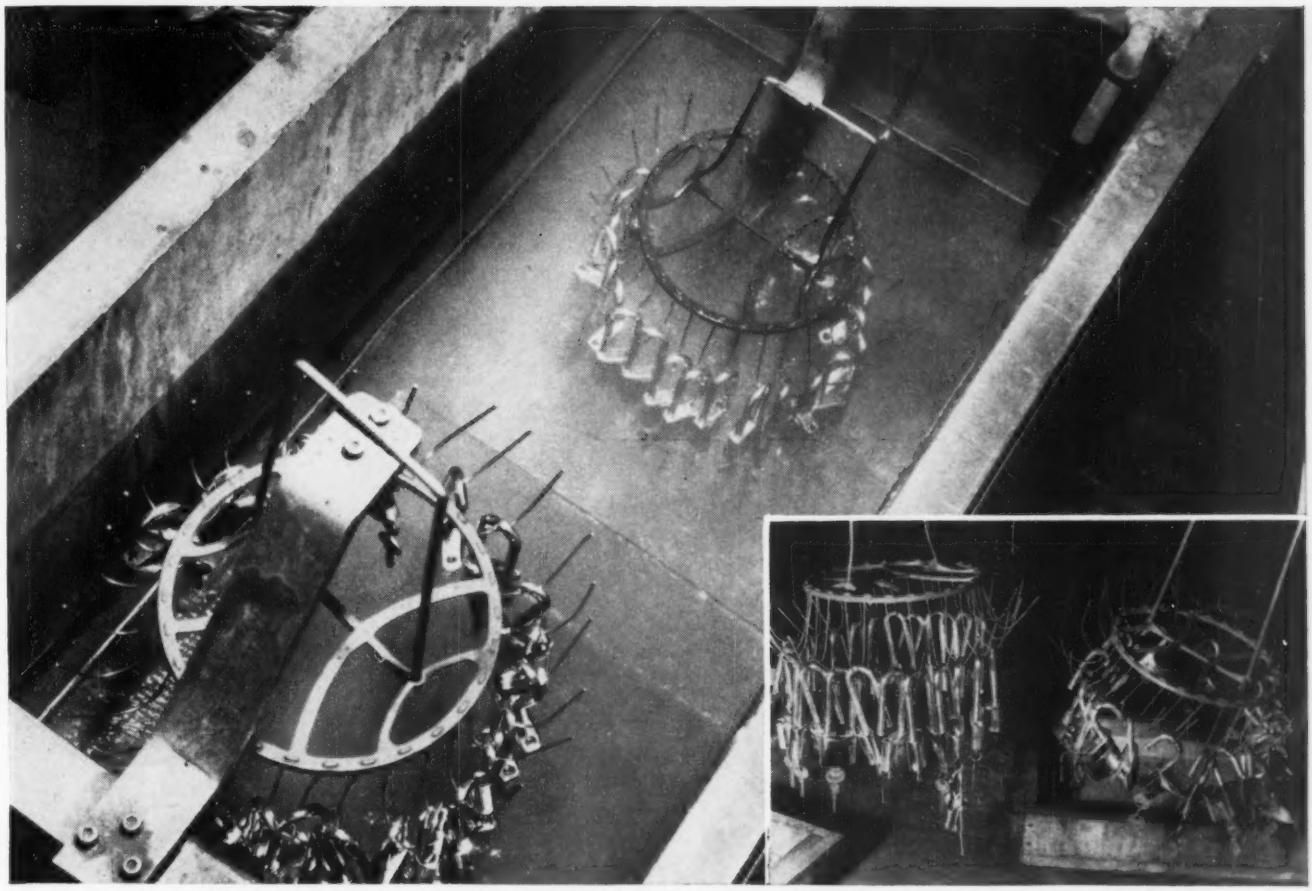
BRANCHES:
Buffalo • Cleveland • Indianapolis • New Haven



Showing Automatic Loading Device and Automatic Barrel Unloading Station on Stevens Automatic Barrel Processing Machine, incorporated as part of the Straight-Flow operation.



Millions of small stamped fastening devices, pre-assembled screws and nuts, and twisted-tooth lockwashers are automatically washed, parkerized, zinc and cadmium plated in Stevens Automatic Barrel Processing Equipment annually at this modern plant. Cleaner operation, fewer rejects and better control of plating thickness are some of the advantages being realized by the operators.



Brass padlock assemblies being degreased. "Triclene" D assures clean, dry, metal surfaces, ready for subsequent treatments.

Padlock assemblies prior to degreasing. Key sets are left in the locks to eliminate possibility of mixing keys.

American Hardware Reports:

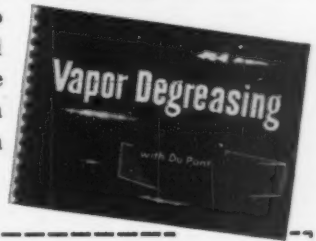
"50 to 75% longer time between degreaser cleanouts . . . brighter cleaning . . . with TRICLENE® D"

In April 1955, the P. & F. Corbin and Russell & Erwin Divisions of the American Hardware Corp., New Britain, Conn., began using "Triclene" D trichlorethylene exclusively in their six conveyorized and three manual degreasers. Their builders' hardware line includes locks and door fittings with highly polished surfaces of brass, bronze, copper, steel and zinc.

Since they started using "Triclene" D, they report: "...brighter cleaning...no necessity to wipe parts before lacquering." They also noted a steadier pH and solvent went 50 to 75% longer before a cleanout was needed. Moreover, "the coils are easier to clean."

Heat, light, air, acids and aluminum chloride will not affect "Triclene" D with locked-in stabilizers. This rugged solvent safely cleans even the most delicate metal surfaces. "Triclene" D retains its original purity longer . . . gives bright cleaning of any metal, distillation after distillation. Yet it costs no more than ordinary solvents!

Get all the facts on Vapor Degreasing in this new Du Pont book. Forty-two pages of data, figures and illustrations cover all the latest developments. For a copy—without obligation—mail the coupon below.

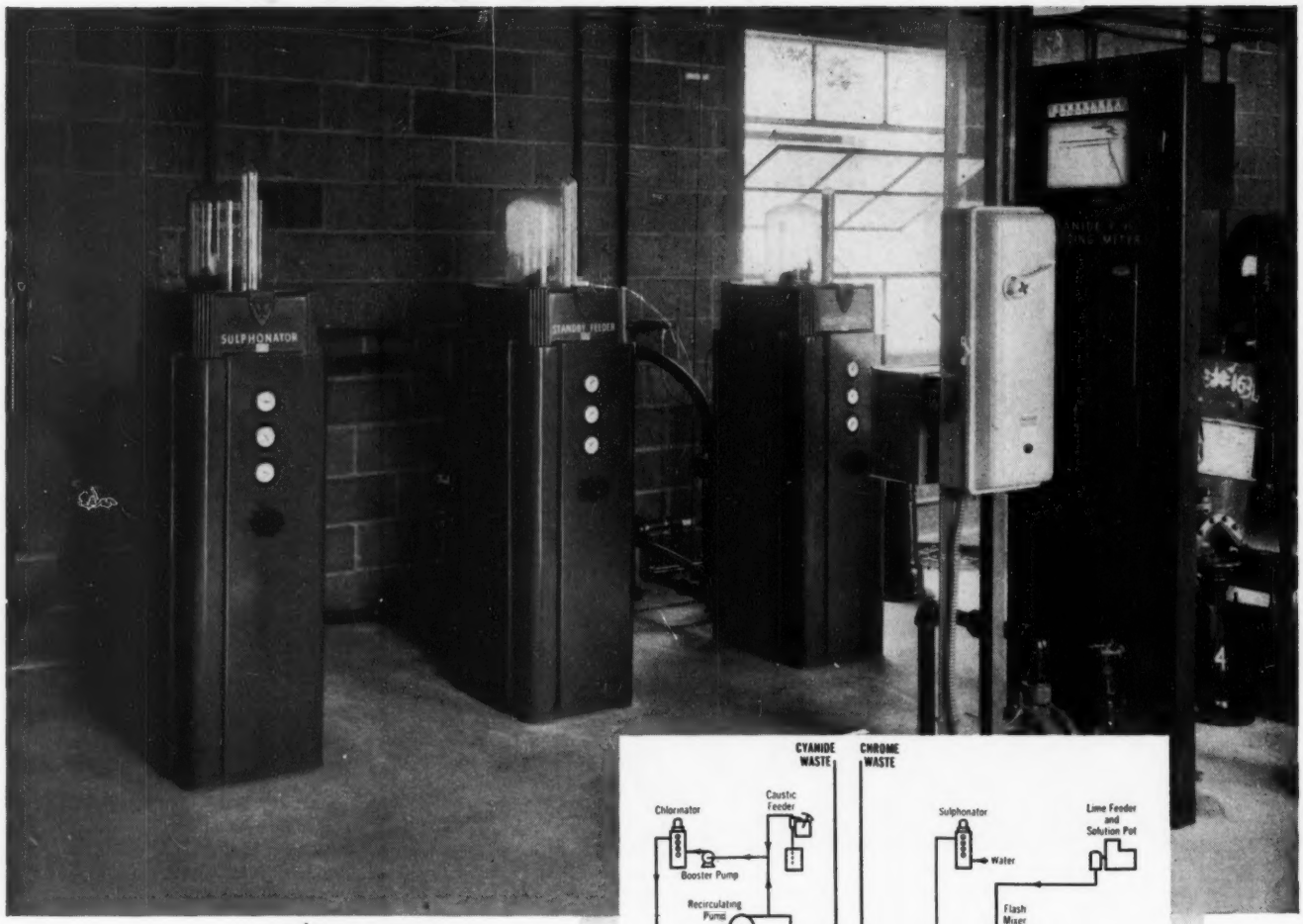


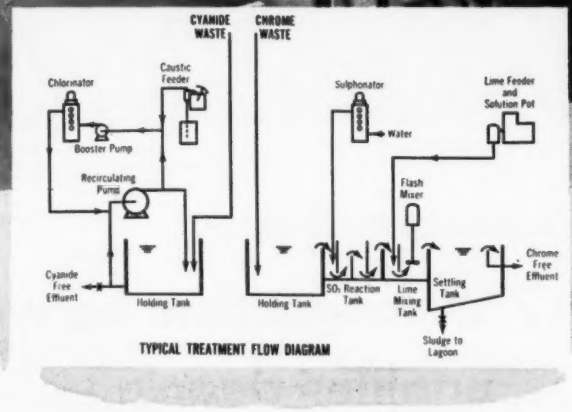
TRICLENE® D
TRICHLORETHYLENE
DU PONT
REG. U. S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Department MF-8
Wilmington 98, Delaware

☐ Please send me a copy of your new Vapor Degreasing book.
☐ Please have your Representative phone for an appointment.

Name_____ Title_____
Company_____
Address_____
City_____ Zone_____ State_____





TYPICAL TREATMENT FLOW DIAGRAM

DAYSTROM INSTRUMENT DIVISION USES

W&T *Cyanide & Chrome Waste Treatment*

The Daystrom Instrument Division of Daystrom, Incorporated, located at Archbald, Pennsylvania, has provided a compact and efficient treating plant to destroy the toxic components of their plating waste. The treatment plant has been in continuous operation since 1953.

The cyanide bearing waste is treated with chlorine and caustic, using a W&T Water Diaphragm Chlorinator and a W&T Chemical Solution Feeder. The treatment breaks down the cyanide to harmless carbon dioxide and nitrogen gas components.

The chromium bearing waste is treated with sulphur dioxide and lime, using a W&T Sulphonator and a W&T Dry Chemical Feeder. The treatment removes the toxic chromium and other heavy metals from solution, to be disposed of as sludge.

If you would like more information on Wallace & Tiernan cyanide or chromium waste treatment, write for bulletin RA-2120-CM.

WALLACE & TIERNAN INCORPORATED

125 MAIN STREET, BELLEVILLE 9, NEW JERSEY

I-52

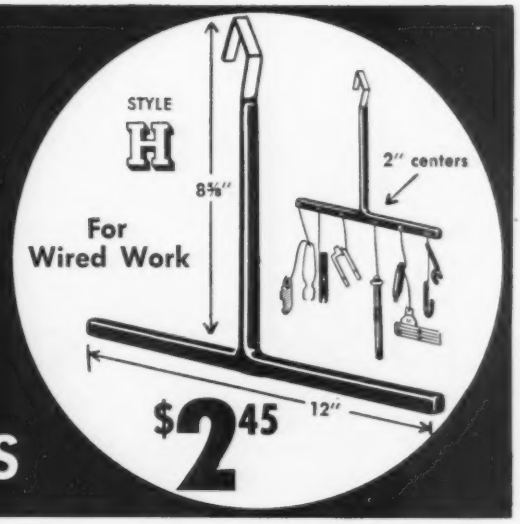
MANY FINE SURFACES REFLECT THE USE OF PFIZER CITRIC, GLUCONIC AND TARTARIC ACIDS—Pfizer Citrates, Gluconates and Tartrates contribute to brightness like you see above. Whether it be through electroplating, cleaning or polishing, these Pfizer organic acids offer many advantages to metal finishers. One big advantage is **NON-TOXICITY**—greater safety for personnel in materials handling. Another advantage is mildness—so necessary in household and specialized industrial cleaners and polishes. Write for *Technical Bulletin 61* which describes in detail the many outstanding uses for **PFIZER ORGANIC ACIDS** in metal finishing.

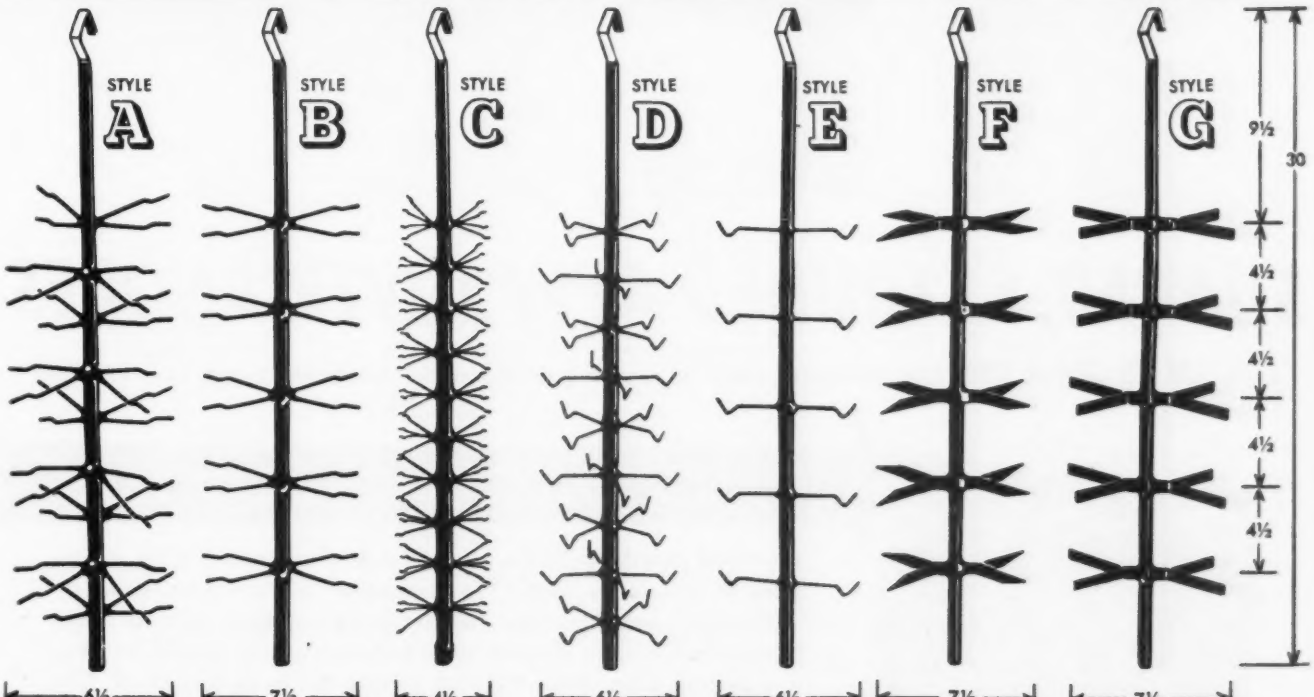
Manufacturing Chemists for Over 100 Years

Pfizer

CHAS. PFIZER & CO., INC.
Chemical Sales Division
630 Flushing Ave., Brooklyn 6, N. Y.
Branch Offices: Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.; Atlanta, Ga.; Dallas, Texas

New, Ready Made Mass-produced Economy Plating Racks





A	B	C	D	E	F	G
Tips .114 dia. phosphor bronze	Tips .114 dia. phosphor bronze	Tips 1/16" dia. phosphor bronze	Tips 3/32" dia. phosphor bronze	Tips 3/32" dia. phosphor bronze	Tips 1/16x1/2" phosphor bronze	Tips 1/16x1/2" phosphor bronze
$5.78	$4.77	$6.00	$5.83	$4.42	$5.84	$5.69

Add $1.50 packing charge on orders for less than 12 racks.

Made of BEST materials obtainable

SPINES are one-piece solid copper, round cornered and sand-blasted for perfect adhesion of the insulation.

RIGID CONSTRUCTION. The phosphor bronze tips are riveted to the spine, then soldered where necessary for complete rigidity. **Do not confuse with Thinker Boy construction—the tips are not replaceable.**

COATED AFTER ASSEMBLY with the same Universal Plastic used on BELKE Custom-Built and Thinker Boy Racks—withstand all cleaning and plating cycles.

The low prices are made possible through economies of mass production. No specifications can be changed at these prices except in mass production quantities. Prices subject to change with changes in costs.

Place your order early

Economy Racks will be stocked for immediate shipment as soon as production catches up with the demand. In the meantime please order in advance of your requirements and avoid disappointment.

Belke Manufacturing Company
947 N. Cicero Ave., Chicago 51
EVERYTHING FOR PLATING PLANTS

3 STANDARD SHAPES

"RECTANGULAR"

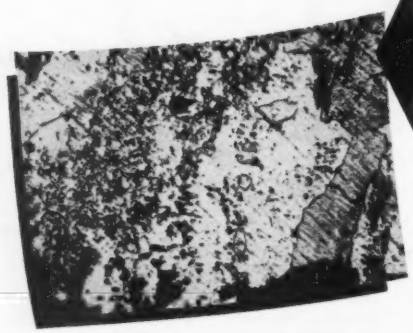
"TEAR DROP"

"DOG BONE"

N E W !

SHAPED, EXTRUDED APW SILVER ANODES

CONTROLLED GRAIN SIZE: APW EXTRUSION PROCESS* controls grain size within definite limits—minimizes sheddings



ROLLED FLAT PLATE ANODE SECTION: Photomicrograph illustrates highly irregular, uncontrolled grain size—a major cause of shedding and rough electrodeposits.

*Pat. Pending

APW EXTRUDED ANODE SECTION: Note small, fully controlled regularity of grain size to promote uniform corrosion, smoothest electrodeposits and less rejects.

The three standard shapes of APW Extruded Anodes were developed to extend the useful life of anodes—*to lower plating costs!*

Through scientific design, the distribution of mass material helps to maintain a more efficient ratio between anode weight and active surface area. After 85% by weight has been plated off, this APW anode *retains 80% of its original active surface area!* You profit three ways with longer anode life, minimized polarization and less silver scrap to be refined.

Another equally important advantage of the new APW Extruded Anode is the small, uniform grain size—*controlled between definite ideal limits!* As a result, corrosion is smooth and uniform for consistently smooth electrodeposits. Shedding is virtually eliminated—rejects are a comparative rarity!

To be certain the silver you buy in anodes is used most efficiently, APW will develop special anode shapes to meet particular plating bath conditions. We'll be glad to assist with your anode problems.

THE AMERICAN PLATINUM WORKS

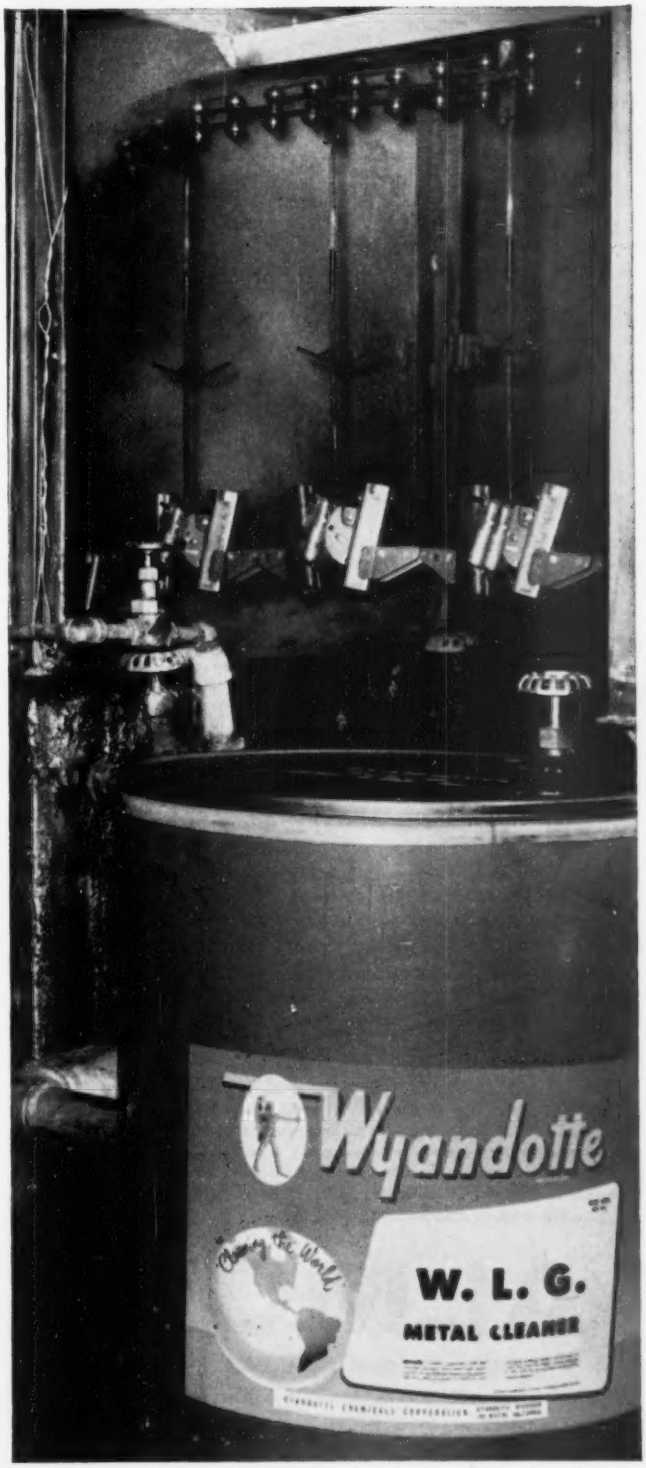
231 NEW JERSEY RAILROAD AVENUE • NEWARK 5, NEW JERSEY

APW

ENGELHARD INDUSTRIES

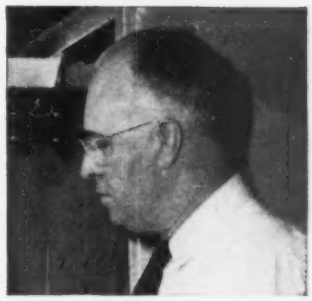
Wyandotte W.L.G.

removes drawing compound and strips paint in a single operation at Ryerson & Haynes



Auto bumper-jack parts and conveyor hooks are cleaned simultaneously in W.L.G. solution prior to painting.

"Wyandotte W.L.G. does double-duty for us"



...says Paint Superintendent E. J. Bosca, Ryerson & Haynes, Inc., Jackson, Mich.

"IT CLEANS the auto bumper-jack parts we manufacture, *and* strips accumulations of baked-on paint from conveyor hooks — both in the same operation!

"Prior to painting, a continuous conveyor system draws the bumper-jack parts through a solution of W.L.G. The parts are then spray-rinsed, air-dried and painted. And we never remove the conveyor hooks to strip the hardened paint — this is done on each conveyor circuit as the hooks pass through the W.L.G. bath. The combined cleaning and paint stripping operation takes only three minutes, and has given us trouble-free service for the past ten years."

Wyandotte W.L.G.* is a free-rinsing, heavy-duty metal cleaner, designed for exceptional detergency, long life (flowing off grease daily, Ryerson & Haynes uses a tank of W.L.G. solution for three months!), and a variety of applications. Used in soak tanks, tumbling barrels, rotary washers, and low-pressure spray washers, W.L.G. removes heavy oils, drawing compounds and many types of paints from all ferrous and some nonferrous metals. For complete information on W.L.G. and other Wyandotte metal-cleaning products, call your nearest Wyandotte representative. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.*

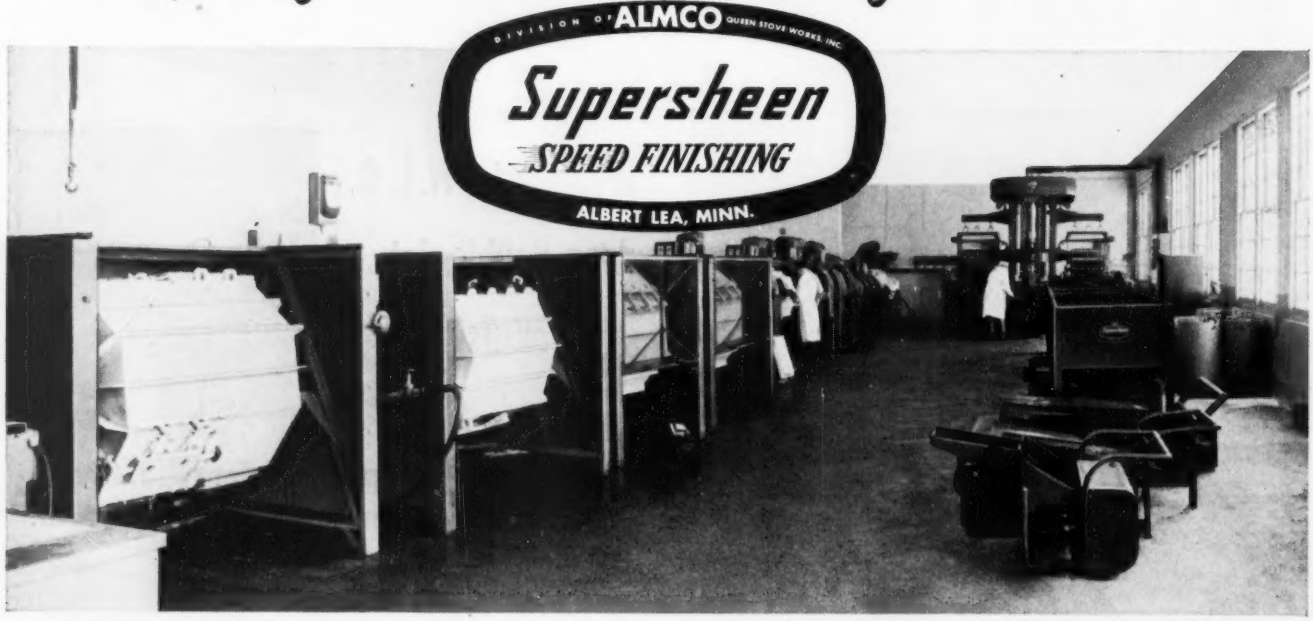
*Reg. U.S. Pat. Off.

Wyandotte CHEMICALS

J. B. FORD DIVISION

Specialists in Metal-Cleaning Products

How to get cost-saving answers to your *deburring and finishing problems*



Shown above is the main bay of the new Almco Supersheen Barrel Finishing Laboratory, which puts together under one roof the greatest array of machines and equipment ever assembled for sample processing of manufacturers' parts. It offers the broadest service available for the metal-working industry.

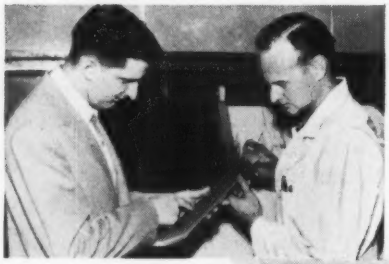
SEND YOUR PARTS FOR SAMPLE PROCESSING IN THE WORLD'S MOST COMPLETE BARREL FINISHING LABORATORY!

Wouldn't you like to achieve what so many other manufacturers have done . . . reduce deburring and finishing costs BY MORE THAN 90% as a result of detailed sample parts processing in The Almco Laboratory?

It's a practical way for you to find out, at no obligation whatsoever, what the most modern barrel finishing techniques can do to reduce costs and streamline production for you on operations such as descaling, deburring, grinding, burnishing, forming radii, obtaining ultra-low microinch surfaces, etc.

Almco has perfected notable advancements in barrel finishing, and the enlarged Laboratory features all of the latest Almco Supersheen barrels and equipment. Whether you have a small shop or a large department, you can be sure that sample processing of your parts will be done with production equipment similar to that which can reproduce the processes in your own plant. And your Almco report will be a down-to-earth factual analysis.

Why not take advantage of this popular Almco service? You may accomplish savings in time and labor never before possible, plus absolute uniformity in the quality of your parts.



An Almco Lab technician and a visiting finishing engineer examine a part during sample processing.

Final Almco report to the manufacturer is factual and complete in every detail.

WRITE TODAY Simply use your company letterhead, requesting an Almco Sales Engineer to call and make arrangements for sample processing. Or send sample parts along, with specification of results desired. (If possible, include finished part for guide.) Your Almco report, at no obligation, may show you the way to tremendous savings!

ALMCO

DIVISION OF QUEEN STOVE WORKS, INC.

48 Marshall Street • Albert Lea, Minnesota

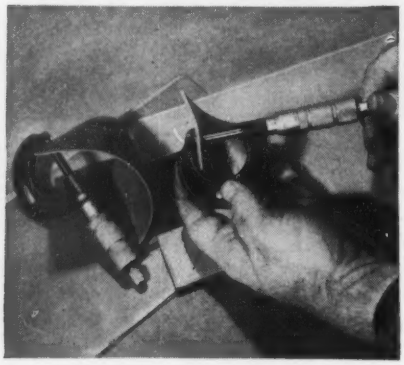
Sales Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven, Philadelphia and London, England

NEW CHROMATE DIPS CUT COSTS

Protective coating 60 mils thick or more with one spraying

Another improvement in plastisol coatings has again been achieved. Unichrome "Super 5300" Coating delivers the full solids content of vinyl plastisol through a spray gun and builds up a coat 60 mils thick or more in one application. Less of course, if desired.

The coating is physically tough and flexible. It doesn't chip or tear. It has



the chemical resistance as well as the thickness to withstand contact indefinitely with plating solutions, cleaners, water and other corrosives.

Send for Bulletin SVP-1 which gives more data.

**Unichrome is a trademark of Metal & Thermit Corp.*

Unichrome Dips developed that provide chromate solutions with lower make up and operating costs

An unusually wide line of Unichrome Dips for zinc plate, die castings, and cadmium has been made even more inclusive by three new additions to the line. Two of the new compounds are the dry, or powder, form for extra economy in shipping and handling. The third is a wet compound which facilitates solution mixing. All, however, work at extreme dilutions.

NEW ECONOMY

At low make-up concentrations, cost of these three Unichrome Dips descends to a new low. Unichrome Dips are also known for the long service they give before being discarded. End result is the low cost per sq. ft. of finish reported by so many users of Unichrome Dips.

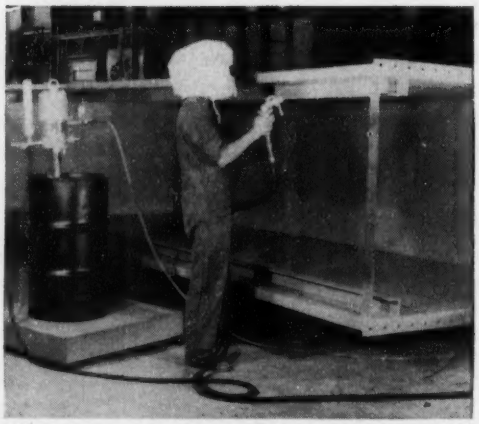
MATCHED TO THE NEED

Unichrome Dip Solutions, forming corrosion-resistant finishes integral with the zinc, improve and protect its eye appeal. Since chromate dips are active solutions which *strip* the zinc as well as convert its surface into an attractive but inactive film, the type of equipment used and the operating time or cycle affect results. The differing needs of manual or automatic finishing must be satisfied to produce the color, the corrosion resistance, the uniformity of finish —as well as the economy desired. No single chromate solution is equally suitable for all applications. This explains why so many specialized Unichrome Dip Compounds are available.

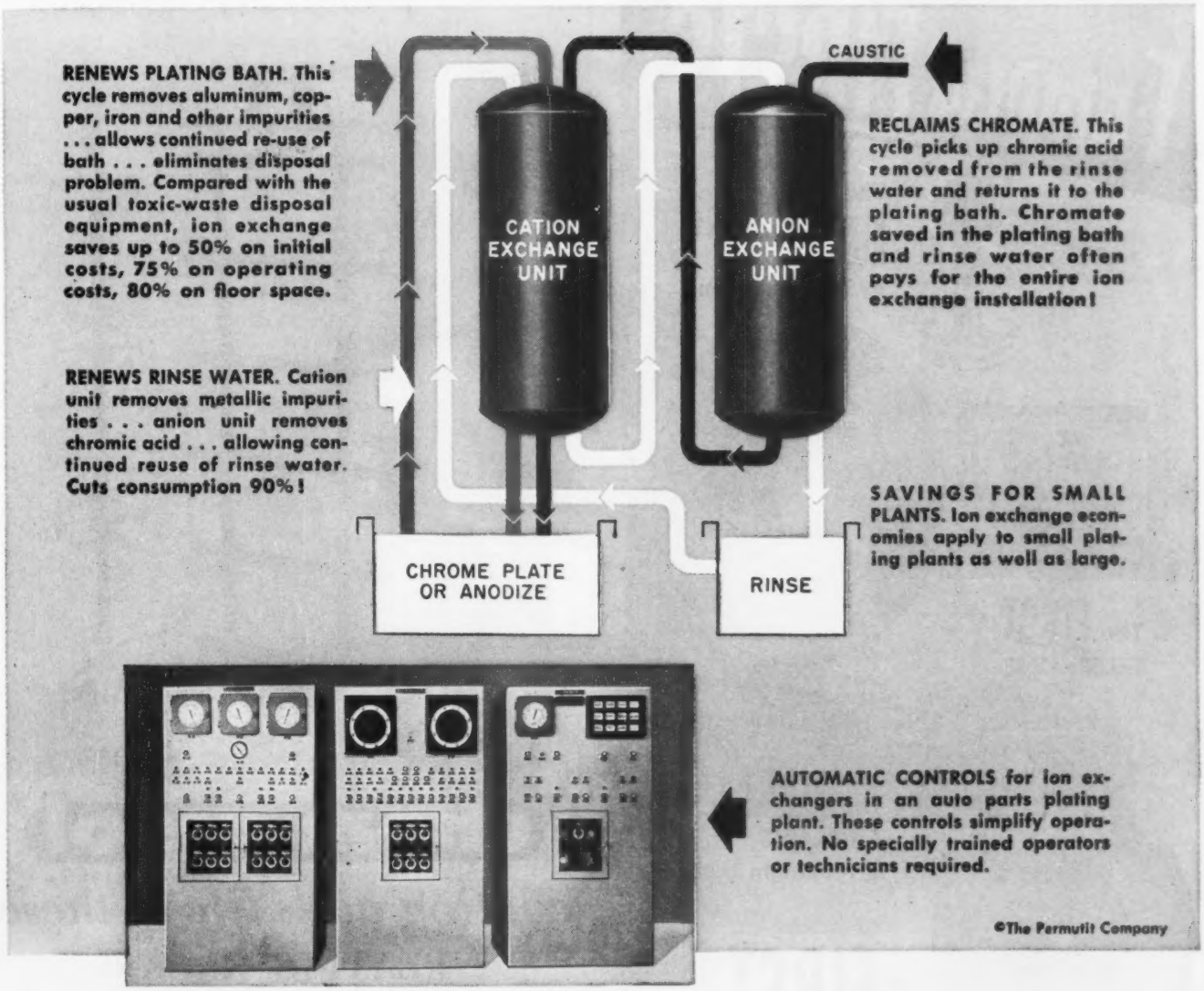
Metal & Thermit will gladly recommend the proper dip to meet specific needs. Simply submit details of the product and the requirements.

Plastisols ideal for protecting tanks

Because of its thickness, chemical inertness and sprayability, the new Unichrome "Super 5300" Plastisol Coating makes a superior tank lining. It can withstand continuous contact with severely corrosive solutions, save over the cost of applying sheet-type linings, and has no seams for corrosive solutions to penetrate. Moreover, there now exist a number of strategically located companies skilled in applying Unichrome Plastisols, and which have the baking facilities to handle even large tanks. Send for names.



Large plating tanks being sprayed with Unichrome Plastisol prior to being wheeled into baking oven for curing.



Ion Exchange Cuts Plating Costs

Modern ion exchange equipment really pays off for plating plants. Here's why:

Faster production. Dip periods are shorter, and there's no down-time for dumping because baths are always at full strength. Time savings are biggest for bright-dipping, anodizing, etching, stripping.

Better quality. Clean baths produce more uniform plating deposits. Clean rinses prevent water stains and spots.

Lower operating costs. Contaminant-free baths use less current. The improved quality means fewer rejects . . . and reduced polishing and wiping costs.

A large aircraft manufacturer saved $10,000 on anodizing in the first year with ion exchange. A leading auto maker prevented a stream pollution shut-down, improved quality, reduced costs . . . and uses the same ion exchange equipment for treating other process water in the plant!

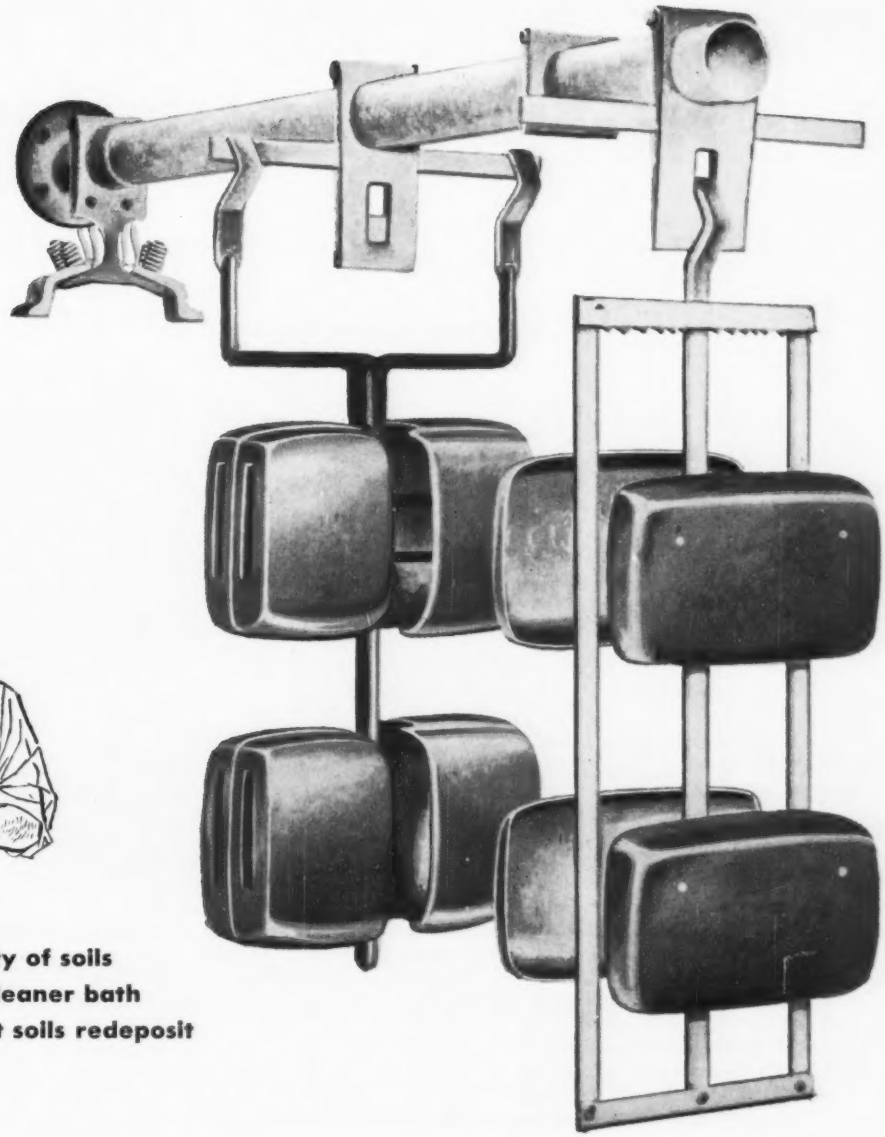
Largest manufacturer of ion exchange equipment, The Permutit Company, is the only firm that offers a complete ion exchange service: rinse water or bath analysis, engineering, equipment, ion exchange resins and automatic controls . . . *all from one source.*

For details, write: The Permutit Company, Dept. MF-8 330 West 42nd St., New York 36, N. Y.

PERMUTIT®

rhymes with "compute it"

ION EXCHANGE for Water Conditioning
Chemical Processing • Industrial Waste Treatment



PENNSALT CLEANER 36

- **Removes greater variety of soils**
- **Extends life of electrocleaner bath**
- **Rinses freely—won't let soils redeposit**

FOR A BETTER PLATE AT LOWER COST, soak-clean steel parts with new PENNSALT CLEANER 36

Here's a new soak-tank cleaner that's sure to bring down the cost of starting your plated finish! PENNSALT CLEANER 36 removes not only *more soil* but *more kinds of soil* than previous soak compounds. Because of its unusual detergent power and long life, Cleaner 36 lets you cut the concentration in your soak tank as much as 50% without losing cleaning efficiency.

LONGER ELECTROCLEANER LIFE. When used as a pre-cleaner before an electrocleaner (such as Pennsalt K-8), Pennsalt 36 removes the worst shop grimes and buffing compounds, leaving the electrocleaner bath free to work more swiftly and last longer. Plating rejects drop, cleaning costs drop, profits increase.

FREE RINSING. Once removed with Pennsalt Cleaner 36, soils can't redeposit on the work. Even if they dry on before rinsing, cleaner residue and soils flow off freely.

WATCH HOW 36 WORKS—in your own soak tanks! Ask the Pennsalt man for a demonstration, or write Metal Processing Dept. 230, Pennsylvania Salt Manufacturing Company. East: Three Penn Center Plaza, Philadelphia 2, Pa.; West: 2020 Milvia Street, Berkeley 4, Calif. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

Pennsalt Chemicals

Metal Cleaners • Phosphate Coatings • Cold-Working Lubricants

A BETTER START FOR YOUR FINISH

SPECIAL REPORTS ON FINISHING NON-FERROUS METALS

NUMBER III—Lustrous, Corrosion-Resistant Finishing with Chemical Polishing Iridite

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

Chromate conversion coatings are widely accepted throughout industry as an economical means of providing corrosion protection, a good base for paint and decorative finishes for non-ferrous metals. Certain of these coatings also possess chemical polishing abilities that have luster-producing, as well as corrosion-inhibiting, effects on zinc and cadmium plate, zinc die castings and copper alloys. However, continued developments in this field have been so rapid that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this discussion of the many ways in which this chemical polishing characteristic can be used in final finishing or pre-plating treatments to produce a lustrous appearance with distinct display and sales appeal and appreciable savings in cost. Report I on decorative, corrosion-resistant finishes and Report II on paint base corrosion-resistant finishes are available on request.

The degree of luster possible on a surface is a function of the degree to which the surface can be smoothed. Leveling to provide a smooth surface can be achieved by mechanical or chemical means, or a combination of these, depending upon the luster desired and the original condition of the metal. Chemical polishing effectively imparts luster otherwise difficult and costly to obtain. For this reason, it is often used to supplement or entirely replace mechanical polishing, depending upon the application and the original condition of the metal. Chemical polishing has the additional advantage of providing overall treatment of the submerged part. It reaches into even the deepest corners and recesses that are otherwise inaccessible. Certain of the Iridites are specifically designed to perform this chemical polishing operation. Also, they provide corrosion protection as do all Iridites, thus may be used as a final finish or a pre-plating polish.

If Iridite is to be used as a final finish, in contrast to pre-plating treatment, the chromate conversion coating generated is allowed to remain, providing good corrosion resistance. Color inherent in these Iridite films ranges from a yellow cast to yellow iridescent. These coatings may be used without further treatment where this color is acceptable and good corrosion resistance is desired. Further, these basic coatings can be tinted by dyeing. Among the dye tints available are shades of red, yellow, blue and green. If desirable, the basic coatings can also be modified by a bleach dip leaving a clear bright or blue iridescent finish. In all cases bleaching reduces corrosion resistance.

As examples of this type of final finishing, Iridites #4-73 and #4-75 (Cast-Zinc-Brite) make possible for the first time, lustrous chemical polishing of the as-cast surface of zinc die castings. Thus, in many cases, sizeable savings in finishing cost are realized by elimination of plating costs. This economical method can be used on tools, appliance parts, toy pistols, locks and many other small castings. Another example is the treatment of copper and brass parts, such as welding tips, to eliminate buffing and provide additional corrosion resistance. In many cases, handling costs are reduced appreciably by replacing piece-part handling with bulk processing. Still another example of the use of this chemical polishing and protective quality of Iridite is a simple system of zinc plate, Iridite and clear lacquer instead of more costly electroplated finishes. Typical of this type of lustrous finish are builders hardware and wire goods.

As a pre-plating treatment, in contrast to final finishes, Iridite can be used to chemically polish zinc die castings or copper prior to plating. In such cases, Iridite should be applied as an in-process step, so that the protective film is removed before the plating cycle. The savings in handling, material and labor costs are obvious. This process has made it practical to plate chrome directly over copper on steel, conserving nickel, yet producing a lustrous chrome finish. Used after stripping faulty plate in reprocessing zinc die castings, Iridite restores luster to the casting, thus making possible replating without blistering.

Other Iridite finishes are available to produce maximum corrosion resistance, a wide variety of decorative finishes and excellent bases for paint on all commercial forms of the more commonly used non-ferrous metals. As a final finish, appearance ranges from clear bright to olive drab and brown and many films can be bleached or dyed. As a paint base Iridite provides excellent initial and retentive paint adhesion and a self-healing property which protects bare metal if exposed by scratching. Iridites have low electrical resistance. Some can be soldered and welded. The Iridite film itself does not affect the dimensional stability of close tolerance parts.

Iridites are widely approved under both Armed Services and industrial specifications because of their top performance, low cost and savings of materials and equipment.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product demands the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 East Monument Street, Baltimore 5, Maryland.

(Advertisement)

LEAROK

THE BUFFING COMPOUND WITH NO FREE GREASE

provides BUFFING at its BEST-

And clean buffing, too, because in LEAROK there is no free grease to pack into crevices or recesses.

We say BUFFING AT ITS BEST because the same care in selection of abrasive bonding materials and in manufacture goes into LEAROK as into LEA COMPOUND, industry's leading greaseless abrasive compound.

The name LEA has a special reputation throughout the metal finishing field. That reputation covers a world wide service of helping industry to do better surface finishing at lower cost. Each of the many LEA products, of which LEAROK is but one, aims straight for that target.

Every bit of knowledge and experience with problems of finishing metals, plastics, etc., gained over many years of service goes right into our manufacturing methods and into the selection of materials.

LEAROK is outstanding in quality and buffing effectiveness. If better buffing at lower cost is one of *your* targets, why not investigate and test for yourself the merits of LEAROK? Since we have some 45 different grades, please send with your request for a trial sample full details of your operations so that we can select the proper grade. Send samples of the work, if you can.

Burring, Buffing, Polishing, Lapping, Plating and Spray Finishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions. Manufacturers of Lea Compound and Learok . . . Industry's quality buffing and polishing compounds for over 30 years.

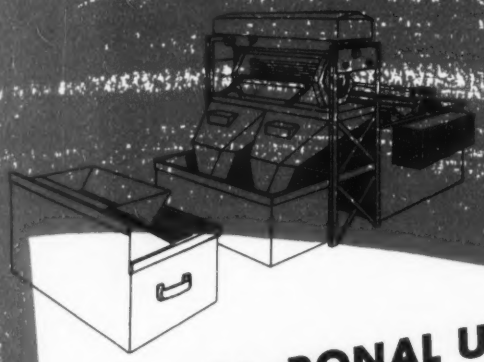
LEA®

THE LEA MANUFACTURING CO.
16 CHERRY AVE., WATERBURY 20, CONN.

Lea-Michigan, Inc., 14066 Stansbury Ave., Detroit 27, Mich.
Lea Mfg. Company of Canada, Ltd., 1236 Birchmount Road, Scarborough, Ontario, Canada
Lea Mfg. Company of England, Ltd., Buxton, England
Lea-Ronal, Inc., Main Office and Laboratory: 139-20 109th Ave., Jamaica 35, N. Y.
Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.

Are you interested in Plating Specialties? **SEE THE OTHER SIDE OF THIS INSERT.** ➡

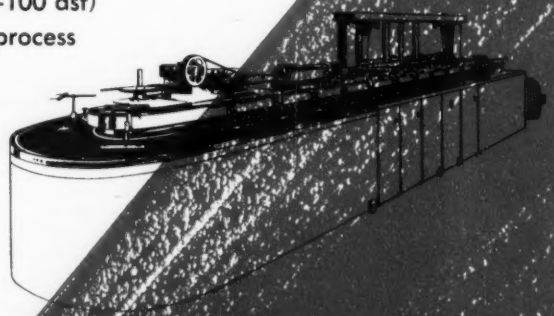
Lea Copper-Glo has a new partner



LEA-RONAL Ultra-Tartral combined with LEA Copper-Glo means that LEA-RONAL High Speed Bright Copper Process is so vastly improved as to be practically a new process.

Here are a few of the new features this new combination will give you:

- freedom from burning in spite of much higher current density
- 50 to 100 percent higher current density (Hull Cell 0-100 asf) over that *permissible* in any former cyanide copper process without reduction of *efficiency*
- higher free cyanide content permitted without loss of efficiency
- sodium cyanide may be used with higher current densities than is possible with an equivalent potassium *formulation* without Ultra-Tartral; this means real economy
- improved anode corrosion
- carbonate tolerance is even greater than ever before; no need to control carbonate.



This new and improved LEA-RONAL High Speed Copper Plating Process offers so much in the way of improved operations and economy that you should make at least a trial run. We suggest that you set aside one tank or section for comparative tests. Our technical staff can recommend a formulation for converting your present cyanide bath to this improved LEA-RONAL Process.

The LEA GROUP
serving the Finishing Field
The Lea Mfg. Co., Waterbury, Conn.
Lea-Michigan, Inc., Detroit
Lea-Ronal, Inc., Jamaica, N. Y.
Lea Mfg. Co., of Canada, Ltd.
Lea Mfg. Co., of England, Ltd.
Plating Polishing Buffing Burring

High Speed Bright Copper Process is a LEA-RONAL INC. Process

On this particular Lea-Ronal Process all inquiries should be directed to:

THE LEA MANUFACTURING CO.
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Are you interested in Buffing, Polishing and Burring Specialties? **SEE THE OTHER SIDE OF THIS INSERT.**

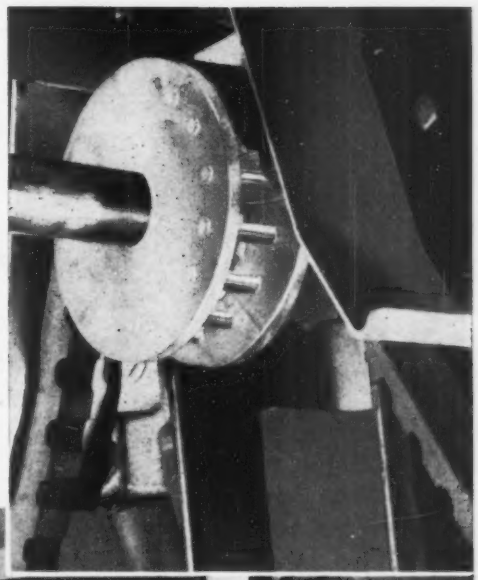
New . . . Exclusive . . .

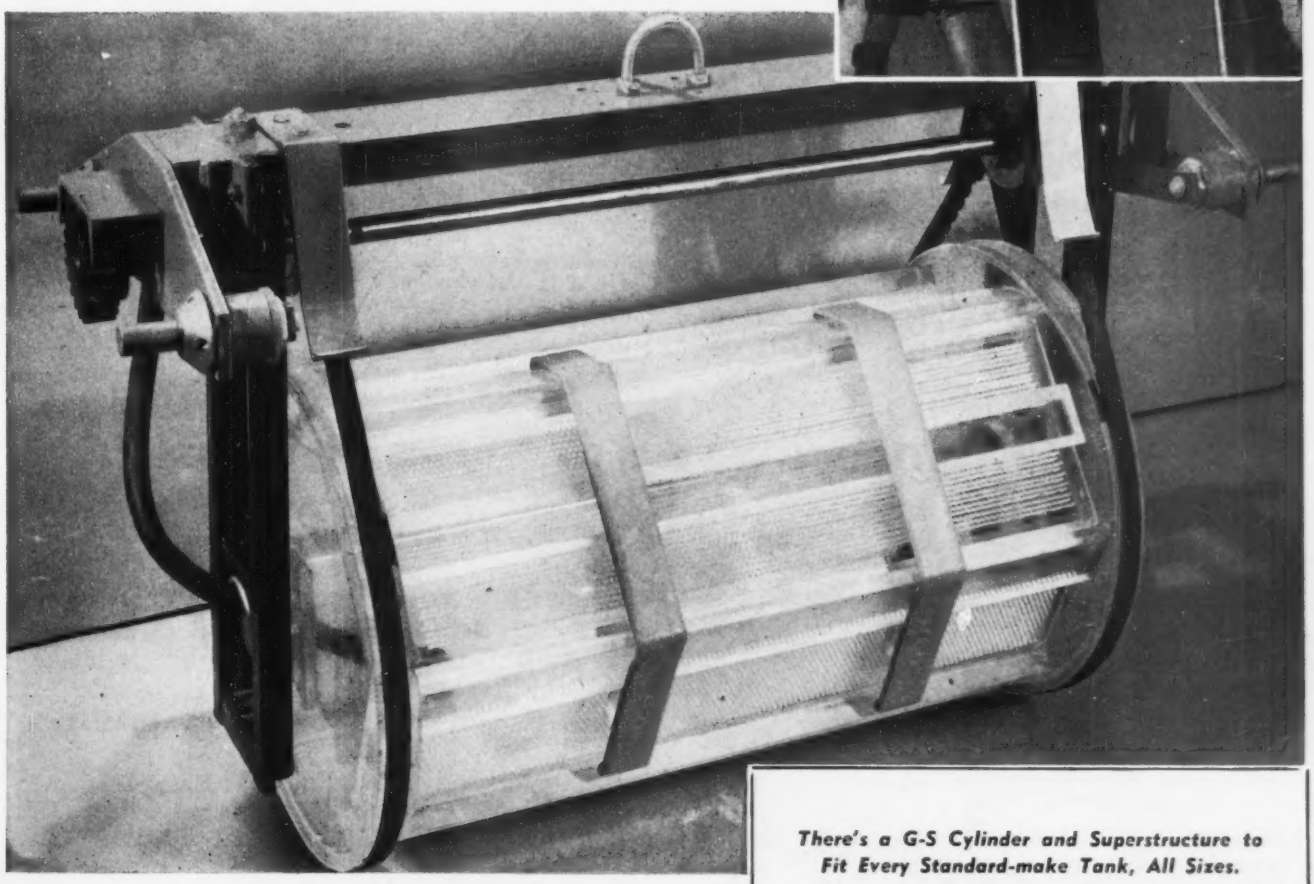
"COGGED-V-BELT"

The BELT-DRIVE with the GEAR-GRIP

Eliminates: Cylinder-End Drive Gear, Idler Gear, Pinion Gear, Bearings

U. S. Pat. 2,562,084. Other Pats. Applied For.





There's a G-S Cylinder and Superstructure to Fit Every Standard-make Tank, All Sizes.

(top inset) Close-up of "Cogged-V-Belt" Drive. (left) Gill-Singleton GSU 14 x 30 cylinder and superstructure for competitive tank.

Cylinders: H-T Sincolite or Tempron (rubber). G-S makes both, to fit any standard make superstructure, any size. Send details with your inquiry.

Cuts Costly Gear Maintenance 100%

Another Gill-Singleton exclusive! Here's *your first* and *only* plating barrel with a belt-drive that doesn't depend on friction-grip alone. G-S "Cogged-V-Belts" mesh with matching cogs in H-T Sincolite Drive Pulleys — can't slip, creep or vary speed. V-belts are molded Neoprene over woven steel tensile members for greater strength. Won't stretch. Belts resist acids, alkalies, floating oil or grease. For all loads — light or heavy — under all conditions. Deliver constant, mechanical-type grip *without gears.* No more gears in solution. No more gear maintenance or replacement.

Other exclusive features: "Locking U-Hubs" — danglers angled down through hubs won't ride up on load. Quick, easy changing of cylinder and danglers saves hours. Adjustable Bearings, Floating End Plates for constant contact — cylinder can't "rock" in saddles. Total cylinder immersion prevents explosions. No solution contaminants on the equipment. Cylinders of H-T Sincolite or Tempron (hard rubber) fusion-welded, heavy-ribbed construction. See more features than ever before offered.

Send for Bulletin GSB 101 and Price List.

The G. S. Equipment Co.

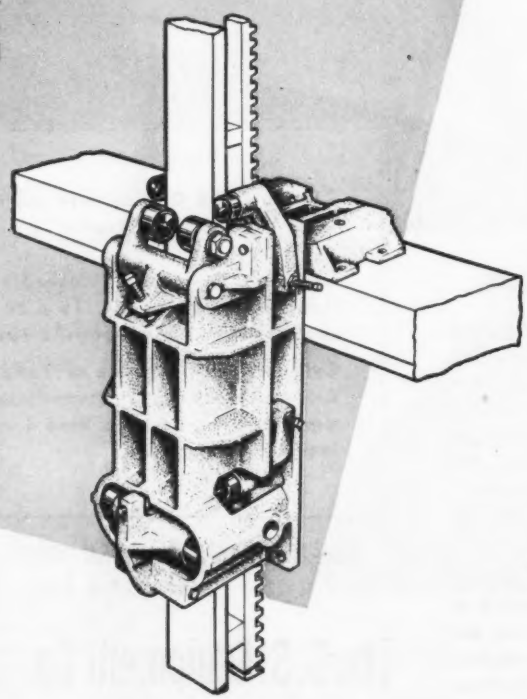
5317 St. Clair Ave., Cleveland 3, O.

ENdicott 1-0167

This 113' pre-enameling machine was running (dry cycling) four days after delivery! Capacity is 100 100-lb. racks per hour. Overall height of arms is *only* 13'.

7 Big

The Wagner Automatic Plating Machine Lifts 3200-pound Ford Thunderbird easily!



Typical pre-assembled single station elevator housing ready for installation over jig-drilled holes in main carriage. Note adjustable roller brackets.

- Increased Load Capacity
- 100% User Adjustability
- Simplified Installation
- Reduced Maintenance
- Practical Flexibility
- Improved Plating Quality
- Lower Production Costs

MANUFACTURERS AND PROCESSORS OF ALL METAL-FINISHING CH

Chicago • Indianapolis • Cincinnati • Rochester, New York •

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Advantages!

IN THIS WAGNER STANDARD PRECISION AUTOMATIC

Of course, you don't use your plating machine as a car hoist. But this proof of the dynamic lift capacity of the precision Wagner Automatic means that deflection under normal loads is minimum. Excessive strain on alignment mechanisms is eliminated, wear and downtime reduced to the vanishing point. Precision adjustments of critical transfer members can be made by untrained personnel—including the main lift boom, carrier lift angle assemblies and carrier rail support brackets. Maintenance is easy, as standard gear racks and pinions are used throughout the entire elevator mechanism, (capacity can be increased 50% by substituting our heavy duty rack). Positive lubrication is provided to each hardened roller—or central lubrication may be installed, at low cost.

Here's how we cut costs of installation, servicing—even later alterations. All details are interchangeable, precision drilled and machined, preassembled. Machines may be lengthened or shortened for long term production changes; parts and entire assemblies, even sections, may be replaced. Every part is drilled, reamed, tapped and milled in special co-ordinated fixtures; sections are assembled in giant jigs and are designed for foolproof self-aligning. A single hydraulic power unit interconnected to two hydromotors with micro adjustment of acceleration and deceleration permits work carriers to be lifted, transferred and deposited gently without loss of parts.

This revolutionary, precision electroplating machine is a big subject. Please send for our technical bulletin and learn all the facts—or call our representative in your area. He'll study your problems and assist in every way to achieve better plating at lower costs.

CHEMICALS, ANODES, AND EQUIPMENT

• *Cleveland* • *Grand Rapids*

MICHIGAN

Wagner BROTHERS INC.

Shoot your chrome questions at Diamond

Let DIAMOND's technical specialists zero in on your chrome-plating problems. These specialists are ready and able to handle your questions—quickly and completely. Their service is free.

In making chromic acid, DIAMOND controls quality from start to finish. DIAMOND experience begins with importing the chrome ore and making the soda ash. It includes *every step* through production and delivery, right up to standing by your side, if you wish, to help you get top-quality plating results consistently, economically.

DIAMOND facilities—two chromic acid plants and nine warehouses and sales offices across the country—assure you uninterrupted supply. DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

DIAMOND ALKALI CHEMICALS

Diamond Chromic Acid

"Our Reflector Finishing Costs Dropped from $4.00 each to 95¢ each

WHEN WE CHANGED FROM ELECTRO-PLATING TO VACUUM COATING"

states

Mr. Elwood C. Rogers
President
Elwood Pattern Works, Inc.
125 N. East Street
Indianapolis, Indiana

NRC "Rapid Cycle" Vacuum Coater used to produce a new lower cost, higher quality finish on enlarger reflectors by Elwood Pattern Works, Inc., one of the country's leading photo enlarger manufacturer.

Other comments made by Mr. Rogers about the benefits resulting from his NRC "Rapid Cycle" Vacuum Coater:

"Customers are enthusiastic" . . .

". . . has eliminated all our troubles".

". . . gave us a reflector that would not tarnish or be affected by the heat".

"Our figures show this unit repays its total initial cost in less than 5 months".

You'll find NRC Vacuum Coaters have other important production advantages. They are easier to load . . . safeguarded from operator errors . . . faster to operate . . . less costly to maintain.

We have had years of experience in making and operating vacuum coaters. We can help you on all the problems involved in setting up a vacuum coating production unit — the size of the coater, method of loading, selection of lacquers, type of coating, and many others.

Get all the facts on the lower costs, improved quality possible with vacuum coating. Send coupon below.

NRC high vacuum products include: dehydrators, freeze driers, gas analyzers, impregnators, gauges, metallizers, pumps, valves, vacuum furnaces.

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EQUIPMENT
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NRC EQUIPMENT CORPORATION
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Dept. 138, Charlemont Street, Newton Highlands 61, Mass.

Please send me the "Rapid Cycle" Vacuum Coater Bulletin. ☐
Have your representative call ☐

Name.....Title.....
Company.....
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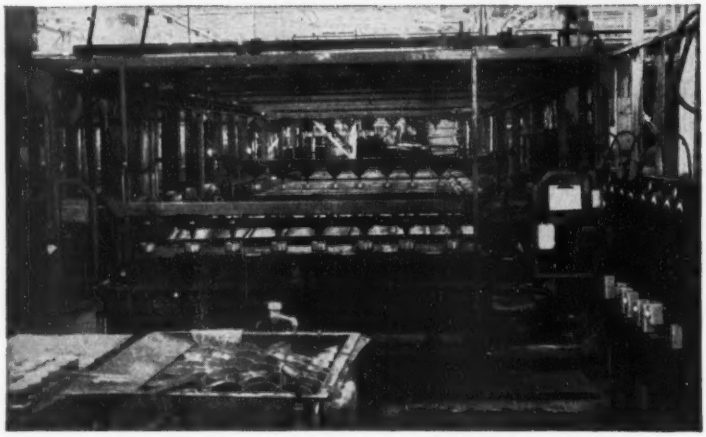
New High Standards in Plating • Processing • Cleaning

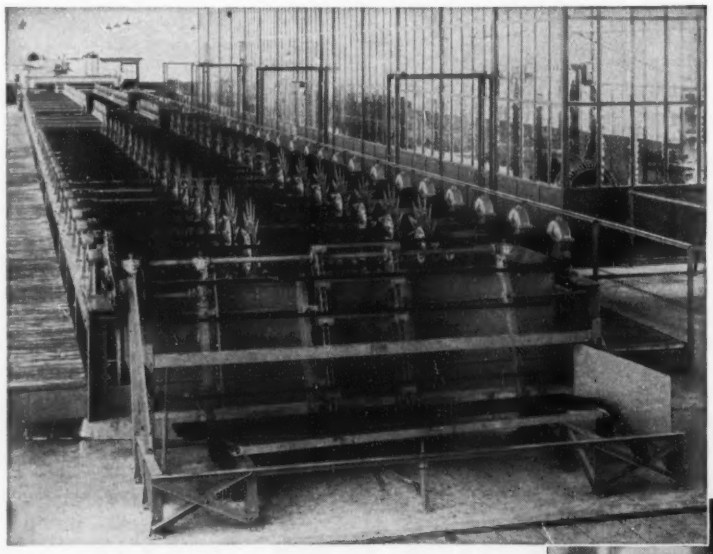


U.S. Fully Automatic Equipment for processing and heavy copper plating the bottoms of popular brand stainless steel cooking utensils. 10 such U.S. installations are in service in 3 plants of this manufacturer.

EQUIPMENT US Since 1896

Provides the Right Combination for More Efficient Operation

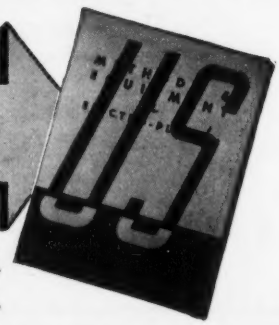
U.S. Equipment leads where production problems call for ingenious engineering and design for improving quality and lowering costs. Whether your job calls for Electroplating, Electrochemical Treatment, Metal Cleaning, Pickling, Acid Dipping, Drying or other related operations in any required series or combination —intermittent or continuous—it will pay to get U.S. recommendations. Our Service Department is at your disposal, without obligation.



U.S. Fully Automatic Conduit Pipe Processing Installation. Performs 24 operations in one continuous cycle including cleaning, acid treatment, zinc plating pipe exterior, enamelling and baking interior surface. Capacity—over 60 million feet of pipe per year. Glass enclosure houses U.S. Generator Equipment.

U.S. Automatic Machine for processing tubular steel furniture components. Performs 22 operations automatically including cleaning, copper, nickel and chrome plating and drying in one continuous cycle. Has 5 parallel processing lanes; each can take different kinds of material.

Write for this FREE Brochure



U. S. —A Complete Line of Plating Barrel, Still Tank, Variable Speed, Semi- and Fully Automatic Equipment • Motor Generators & Rectifiers

U. S. GALVANIZING AND PLATING EQUIPMENT CORP.

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FINISHING PUBLICATIONS, INC.

METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

AUGUST, 1956 Volume 54 Number 8

FEATURES

DEPARTMENTS

Published Monthly By
Finishing Publications, Inc.
Established in 1903 as Metal Industry by Palmer H. Langdon 1868-1935.
Also publishers of ORGANIC FINISHING and annual GUIDEBOOKS and DIRECTORIES.
381 Broadway, Westwood, N. J.
WEstwood 5-1530

L. H. Langdon, *President-Treasurer;* Palmer H. Langdon, *Publisher;* Thomas A. Trumbour, *General Manager;* Joan T. Wiarda. *Sales Manager;* Nathaniel Hall, *Technical Editor;* Fred A. Herr, *Pacific Coast Editor;* John E. Trumbour, *Equipment & News Editor;* Inez Oquendo, *Assistant Editor;* Elizabeth Meyers, *Circulation Manager.*

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Los Angeles 14, Calif.
219 West 7th St.
MAdison 6-5421

Chicago 1
35 East Wacker Drive
FInancial 6-1865

SUBSCRIPTION INFORMATION

United States and Canada $4.00 per year, other countries $8.00. Single copies 45c in United States and Canada, other countries 85c. GUIDEBOOK-DIRECTORY 24th edition 1956 current, 606 pages 5¼x7⅞ $3.50. Please remit by check or money order; cash should be registered. Request for change of address should reach us on or before the 15th of the month preceding the issue with which it is to go in effect. In sending us your change of address, please be sure to send your old address as well as the new one. It is difficult and often impossible to supply back numbers. Re-entered as second class matter June 13, 1940 at the post office at New York, N. Y. under the Act of March 3, 1879.

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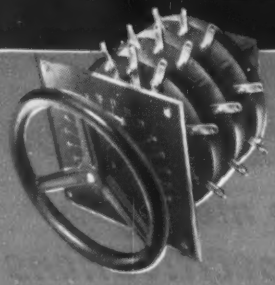
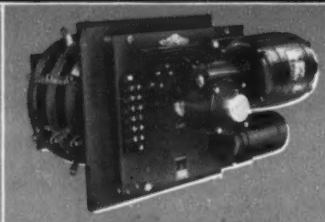
In electroplating, anodizing, and allied processes...

Rectifier Performance Depends on Controls



MANUAL TAP SWITCH CONTROL

For both self-contained and remote controlled units. Used in conjunction with a tapped auto-transformer, it provides 22 positions of voltage adjustment from zero to rated voltage.



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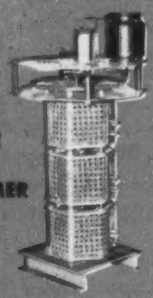
For pushbutton control of output from remote location. Used in conjunction with tapped auto-transformer and it also gives 22 positions of voltage adjustment.



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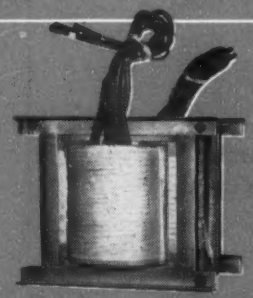

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Wholly electrical — no moving parts. Gives smooth control from 10% to 100% of rated voltage, provided 10% minimum current load is drawn.

The selection of the proper controls with either selenium or germanium rectifiers can be the key to improving your plating and anodizing results. For every installation there is a control which will best fit the application. Let H-VW-M make an engineering survey and recommend the most suitable control to give you not only the best results, but also the maximum in efficiency, flexibility, and economy.

APPLICATION SUGGESTIONS

Use	Recommended Control
Batch Tank Plating	Manual tap switch.
Batch Tank Plating with wide load variations and high production	Motor operated variable auto-transformer or motor operated tap switch.
Barrel Plating	Manual tap switch. No control rectifier.
Cleaning & Pickling	Manual tap switch. No control rectifier.
Conveyor—many stations	Manual tap switch (remote control). Motor operated tap switch. Saturable core reactor. Motor operated continuously variable auto-transformer.
Conveyor—few stations	Automatic voltage stabilization with variable auto-transformer. Automatic voltage stabilization with saturable core reactor.
Chrome strike in combination with Plate	Automatic programming with variable auto-transformer or special series hook-up.
Sulphuric Anodizing	Manual tap switch. Motor operated tap switch. Saturable core reactor.
Color Anodizing	Automatic constant current with variable auto-transformer. Automatic constant current with magnetic amplifier and saturable core reactor.
Chromic Anodizing	Automatic programming with variable auto-transformer. Combination automatic constant current and automatic voltage stablization with variable auto-transformer or saturable core reactor.
Electrolytic Metal Refining	Automatic current control with saturable core reactor.

3170

Need Automatic Voltage Stabilization?

For close DC voltage regulation, automatic voltage stabilization will maintain voltage at pre-set level. Use either sensing panel with motor-driven, oil-immersed continuously variable auto-transformer, or special magnetic-amplifier with saturable core reactor. H-VW-M controls can also provide automatic constant current.

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Motor-operated continuously-variable auto-transformers, plus timers and controls, will set voltage and operate for pre-set time; change to another voltage at pre-set rate; operate at new voltage for given time, then shut the rectifier off.

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METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

ESTABLISHED 1903 VOLUME 54 • NUMBER 8 • AUGUST, 1956

Cold Dips on a Hot Summer Day

Each year, at about this time, with the hottest part of the season still to be suffered through, we come across news reports of water shortages in various parts of the country. It may only be a request to forgo the daily lawn sprinkling, or a warning that reservoirs are low and water should be used sparingly. It may be a threat of drastic restrictions should the situation continue to deteriorate. And, once in a while, we may read about water tables dropping so low that salt water encroachment into wells is experienced or the recuperation rate is too slow to maintain the required water deliveries.

These reports always remind us that industry is a culprit, which always reminds us to remind our readers that plating departments are too often responsible for unnecessary water consumption. Water, fortunately or unfortunately, is usually so inexpensive a commodity that the incentive to avoid wastage is often lacking. Yet, it is really surprising how readily it can be done and how easily money can be saved, once a little effort is expended and some imagination employed.

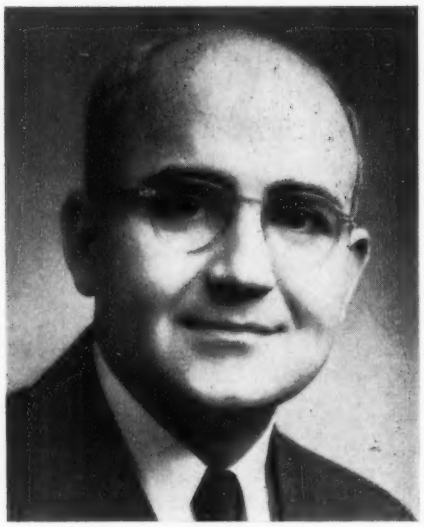
Take rinsing, for example, which accounts for practically all the water used in the plating department. It isn't necessary to install a deionizer in order to save water. A two compartment cascading rinse uses only a very small fraction of the water required by a single rinse to obtain the same results. At least seventy-five per cent of the water can be saved right here! Proper racking to provide better drainage is another principle, which not only will put less of a load on the rinse tanks and minimize contamination of subsequent solutions, but will show a significant saving in chemicals. And, let us not forget the obvious advantages of providing a longer draining period between dips, drag-out tanks, and fog sprays.

When the observant supervisor has exhausted these universal possibilities, he can then concern himself with specific practices peculiar to his operating cycle. For example, water used for rinsing after nickel plating can often be reused in the rinse tank between the acid dip and the nickel tank, since the only contaminant is nickel solution. Similarly, the chromium rinse can be reused in the rinse tank prior to chromium plating. If the difference in head between these stations is insufficient to permit gravity flow, the reduction of the required rinsing water in half is still obtainable, at the small cost of installing a simple transfer pump.

It may be a little too hot these days to develop sufficient interest in the subject, but why not at least make a note to do something about it before next summer comes around?

Nathaniel Hall

HIGHLIGHTS OF THE A.E.S. CONVENTION



Dr. Samuel Heiman
President

Chief chemist and technical director of the Philadelphia Rust Proof Company, Philadelphia, Pa. University of Pennsylvania 1930, Ph.D. 1948. Formerly associated with A. Kenneth Graham and Associates, plating consultants, and with Battelle Memorial Institute. Author of many papers on plating. Former president of the Philadelphia Branch and general chairman of the 1953 convention.

WITH a total registration just missing the fifteen hundred mark, the *American Electroplaters' Convention* held in Washington June 17-21 was a most successful one. *Arthur L. Pierdon*, general chairman and a Washington resident, did not see his home or business during the convention period, which is an indication of the time and hard work necessary to run such a large affair so smoothly. The Children's Program, introduced at this convention for the first time, exceeded all estimates in popularity when 147 children were registered. The handling of this number each day in an efficient manner was a spectacle for the adults to watch as they filed through the lobby on their way to the tours. The meeting rooms and general facilities of the Statler Hotel were about the best the A.E.S. has had for a convention.

John P. Nichols, newly appointed Executive Secretary, who succeeds P. Peter Kovatis.

Business Session

What had been expected to be a stormy business session over the actions of the executive board in changing executive secretaries failed to materialize as the newly selected *John P. Nichols* was introduced to the delegates at the opening meeting, and the resignation of *P. Peter Kovatis* was accepted, who immediately was named Executive Secretary of the *National Association of Metal Finishers*. However, to prevent hasty action on the part of future boards, an amendment to the By-Laws was adopted at the closing session. The new ruling specifies that the President or member of the Executive Board calling for a meeting, must send each board member an agenda of subjects to be considered 30 days prior to the meeting; and no proposals other than those on the agenda can be taken up except by unanimous vote. Many organizations have a similar rule for the protection of minorities, and to avoid the situation of a board member being confronted with a problem concerning which he is entirely unprepared.

The Society budget and publication policies came up for considerable discussion in view of the deficit reported for the past year. A plan to change the policy with regard to the method of publishing the technical proceedings was defeated in spite of financial losses anticipated, and the present method of a separate book retained. The *Milwaukee Branch* presented a motion which was passed, authorizing the board to appoint or hire qualified persons to examine the structure, effectiveness and services of the Society and its related publishing activities, and make a report at the 1957 Convention.

Retiring President *Clyde Kelly* was given a rising vote of thanks and *Dr. Samuel Heiman*, newly elected president, gave him a past president's pin. Vice-presidents are: *Francis Eddy*, *Herbeth Head* and *Ralph D. Wysong*.

Honorary Members Elected

Milton Nadel, secretary of the *New York Branch*, proposed *Thomas A. Trumbour*, general manager of METAL FINISHING, for honorary membership, which was seconded by *George Wagner* of the *Newark Branch*. In his citation Mr. Nadel said, "The New York Branch is pleased to propose for honorary membership in our Society a man who has devoted his entire life to serving the best interests of the electroplating industry. This man is well known to the American Electroplaters' Society as he has never missed an annual convention since 1914, and is present here today.

OFFICERS ELECTED AT CONVENTION

Francis T. Eddy
First Vice-President

General Manager, Technicraft Laboratories, Inc. of Thomaston, Conn. Brown University 1938. Formerly superintendent of finishing at the Chase Brass & Copper Co. of Waterbury. Naval officer in World War II. Member of the A.E.S. since 1938, former president of the Waterbury Branch, former chairman of the New England Regional Meeting, and former chairman of the Paper Awards Committee.

Herbeth E. Head
Second Vice-President

Supervisor of electroplating and related operations of the Automotive Body Div., Chrysler Corp., Detroit, Michigan. Native of Owensboro, Kentucky. Active in the A.S.T.M., S.A.E., Electrochemical Society, Engineering Society of Detroit, Seahorse Institute. Former president of Detroit Branch of the A.E.S. Convention delegate for sixteen years. Served on all industrial Finishing Exposition Committees.

Ralph D. Wysong
Third Vice-President

Chemical engineer in charge of finishes, Studebaker-Packard Corp., South Bend, Indiana. Purdue University 1923. Member of the Advisory Board of the Industrial Waste and Water Resources Committee of the Automotive Manufacturers' Association. Former president of the St. Joseph Valley Branch and a delegate to all A.E.S. national conventions since 1943.

"This gentleman is Tom Trumbour, general manager of METAL FINISHING. Tom is now in his 55th year with this publication and has done a great deal to promote the American Electroplaters' Society, particularly during the years 1912-20 when branches were being established. By attending and reporting these early meetings and carrying news about the Society in the editorial pages, the growth of the A.E.S. was materially aided. Right up to the present time this publication, under his direction, has continued to support the aims and activities of the Society. Tom has been known as the 'platers' friend' and has aided a great many of our members in obtaining new and better positions, thereby helping in the advancement of the industry.

"At the Annual Convention in 1924, he participated in the initial discussion which resulted in the formation of the *International Fellowship Club*, which later became the *Metal Finishing Suppliers' Association*. The work of this group in supporting the annual conventions and general welfare of the plating industry is well known to all.

"In our local branch, Tom has been active since its formation, assisting in publication of the programs, serving on committees, and arranging for publicity in connection with our meetings."

Also elected an honorary member in absentia was *Donald M. Bedwell* of the Los Angeles Branch, plant superintendent of the Hall-Mack Company of Los Angeles. A former branch president, Mr. Bedwell has served in every capacity in the last twenty-five years.

Special Awards

Awards of Merit were presented to *Myron B. Diggin* and *Rudolph J. Hazucha*. Mr. Diggin is vice-president and technical director of the Hanson-Van Winkle-Munning Company, Matawan, N. J. and has served on the Law Committee, Research Committee, Editorial Board and Paper Awards Committee. In 1946 he received the Society's Gold Medal Paper Award and he is a former president of the Newark Branch.

Mr. Hazucha was cited for four decades of service to the A.E.S. and has never missed either a Chicago Branch meeting or a national convention during this entire period. He is a salesman with the Clinton Company of Chicago.

Top Paper Awards Made

Dr. Charles L. Faust and *William H.*

Clyde Kelly
Past President

Mr. and Mrs. Charles T. McGinley being greeted on arrival by *Mr. Fielding Ogburn* as the first in line to register. The McGinleys were attending their 26th A.E.S. Convention and Mr. McGinley was formerly with Wagner Electric. It might be added that they were first in line last year too.

Some of the large group of children registering on Sunday afternoon. *Dr. George P. Swift,* plating consultant from Boston, can be identified in the background.

Children receiving their instructions regarding the program.

A view of the first ladies' luncheon.

A portion of the large group of ladies attending the *"Aunt Ella"* Luncheon.

Officers at the Opening welcome the new Executive Secretary — from l. to r. — *Dr. Samuel Heiman*, First Vice-President; *Herberth Head*, Third Vice-President; *Francis Eddy*, Second Vice-President; *John P. Nichols*, Executive Secretary; *Dr. Ralph Schafer*, Past President; *Clyde Kelly*, President; *Kenneth S. Huston* and *Arthur G. Pierdon*, Convention Chairmen.

The Opening Session in the presidential ballroom.

The Speakers' Table at the M.F.S.A. Luncheon. From left to right: *Walter Helbig*, Atlas Powder Co.; *Ed Huenerforth*, Crown Rheostat & Supply Co.; *Dr. Merton Beckwith*, Harshaw Chemical Company; *August P. Munning*, Munning & Munning, Inc.; *Joseph Duffy*, Pennsylvania Salt Mfg. Co.; *Thomas A. Trumbour*, Metal Finishing; *Clyde Kelly*, President, A.E.S.; *George A. Stutz*, George A. Stutz Mfg. Co.; *Earl W. Couch*, Lea Mfg. Co.; *John Bauer*, Hanson-Van Winkle-Munning Co.; *Ray Ledford*, Industrial Filter & Pump Co.; *Rudy Hazucha*, The Clinton Co.

A portion of the capacity crowd attending M.F.S.A. "*Open House.*"

The first bond winner at M.F.S.A. "Open House." *Mrs. Jean Kershaw*, whose husband is with Hanson-Van Winkle-Munning Co., receiving the good news from Host *Tom Trumbour*.

P. Peter Kovatis — for 3 years Executive Secretary of the American Electroplaters' Society and now Excutive Secretary of the National Association of Metal Finishers.

Safranek of Battelle Institute, Columbus, Ohio, were recipients of the year's top paper award. For their paper, "*The Study of Copper Anodes in Acid and Cyanide Plating Baths,*" both men received the *Carl E. Heussner* award consisting of the *A.E.S. Gold Medal*, a cash prize and an award certificate. This award is co-sponsored by the A.E.S. and the United Platers' Foundation of Detroit, Michigan.

The prize-winning paper was selected for "its high immediate value to the industry along with important new scientific information dealing with a wide spread problem in most plating shops."

The *George B. Hogaboom Memorial Award* went to *R. V. Vanden Berg* of the Aluminum Company of America, New Kensington, Pa. His paper was "*The Commercial Anodizing Surface Treatments for Aluminum and its Alloys.*" This award consisted of the A.E.S. Silver Medal, a cash prize, and an award certificate co-sponsored by the A.E.S. and the Hartford, Connecticut Branch of the Society.

Vanden Berg's paper was chosen "because of the great increase in the use of aluminum and the necessity for more information on surface treatments of aluminum."

The *A.E.S. Bronze Medal Award*, co-sponsored by the A.E.S. and the Grand Rapids Branch of the Society, was given to *J. J. Shyne, H. N. Barr* and *H. G. Schelbee*, all of Vitro Laboratories, Division of the Vitro Corporation, West Orange, New Jersey. This award consisted of a bronze medal and a cash prize and was adjudged third best because "it reveals a new type of process to our industry using a wide variety of new materials," applications of which should greatly increase with the rising interest in new finishes required by the missile and jet engineering industries.

The *Robert S. Leather Mechanical Finishing Award* was not given this year as no papers were judged as eligible.

The *Chromium Plating Award* went to *J. E. Stareck, G. J. Seyb* and *A. C. Tulumello*, all of the Research Laboratories of United Chromium, Inc., Detroit, Michigan. Co-sponsored by the A.E.S. and the Nutmeg Chrome Corporation, West Hartford, Connecticut, this award consists of a cash prize and a certificate.

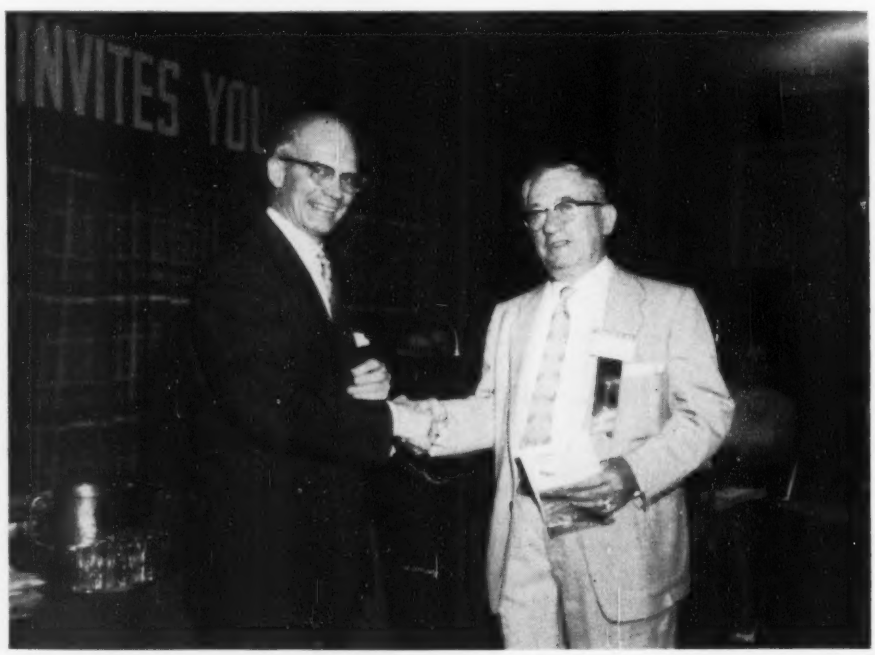
The *Precious Metal Plating Award* was given to *Dr. Harold J. Wiesner* and *H. A. Meers* of Bendix Products Div., Bendix Aviation Corp., South Bend, Indiana. For their paper, "*Further Studies in Heavy Rhodium Plating,*" Wiesner and Meers received a cash award and a certificate, co-sponsored by the Society and Technic, Inc., Providence, R. I.

Metal Finishing Suppliers' Ass'n.

The *Metal Finishing Suppliers' Association Luncheon* was attended by 156 executives and sales personnel of firms selling to the plating and finishing industries. New officers elected were as follows: *Joseph Duffy* with Pennsylvania Salt Mfg. Co., President; *M. M. Beckwith* with Harshaw Chemical Co., 1st Vice-President; *E. W. Couch* with Lea Mfg. Co., 2nd Vice-President; and *Ray Ledford* with Industrial Filter and Pump Co., 3rd Vice-President. *A. P. Munning* with Munning & Munning Co., 202 Emmett Street, Newark 5, N. J., was re-elected Secretary and *Thomas A. Trumbour* with METAL FINISHING was re-elected Treasurer. *Ezra Blount*, editor of "Products Finishing," was Chairman of the Nominating Committee and presented the new slate, which also included as trustees and members of the board — *George A. Stutz* with the George A. Stutz Mfg. Co., *John Bauer* with Hanson-Van Winkle-Munning Co., *Sherman Goble* with American Smelting & Refining, and *Hugh McLeese* with Metal and Thermit Corporation. Progress made during the year was reported on by A. P. Munning. He reported that M.F.S.A. with 175 members had solidified its position in the industry and that the committees were beginning to function in connection with the nickel situation and other problems. Membership certificates were prepared, a new edition of the By-Laws published, a code of ethics drawn up and future plans made. "*Open House,*" sponsored by the M.F.S.A. on Monday night, was attended by the largest crowd in the history of this event.

Retiring President *Herman Struck-*

(*Continued on page* 68)



Clyde Kelly, President of American Electroplaters' Society, presenting *Thomas A. Trumbour*, General Manager of *Metal Finishing*, with Honorary Membership in the A.E.S.

Surface Treatment and Finishing of Light Metals

Part X. Sealing Anodic Oxide Coatings

By S. Wernick, Ph.D., M.Sc., F.R.I.C., F.I.M. and R. Pinner, B.Sc.

THAT anodic oxide coatings lose their absorptive power on steaming was first recorded by Setoh and Miyata.[1] The anhydrous oxide is hydrated, expands and fills out the pore spaces, the Bohmite-type $Al_2O_3 \cdot H_2O$ crystal form being produced with resulting increase in elasticity and decrease in hardness and wear resistance.

The sealing process is applied to most anodic oxide coatings. As already described above, the corrosion resistance of Bengough-Stuart coatings is not generally improved, and indeed is sometimes even decreased, by sealing. However, dyed chromic acid coatings are always sealed.

The chief sealing techniques comprise immersion in boiling water, solutions of dichromates or chromates, silicates, or metal salts which hydrolize in the coating to form hydroxides, such as nickel and cobalt salts, or in solutions of organic capillary active compounds. Electrolytic methods, e.g., acidic sodium-phosphate solutions[2] are also available. Organic substances are also used.

Hot-water Sealing

This is the simplest technique and, in industry, often comprises no more than a prolonged hot-water rinse after anodizing. As has been stated in dealing with the theory of anodizing, the anodic coating takes up water from its environment. At lower temperatures this change is reversible; the water is held physically and does not enter into chemical combination with the alumina. At higher temperatures, however, the alumina combines with water to form $Al_2O_3 \cdot H_2O$ and sealing takes place.

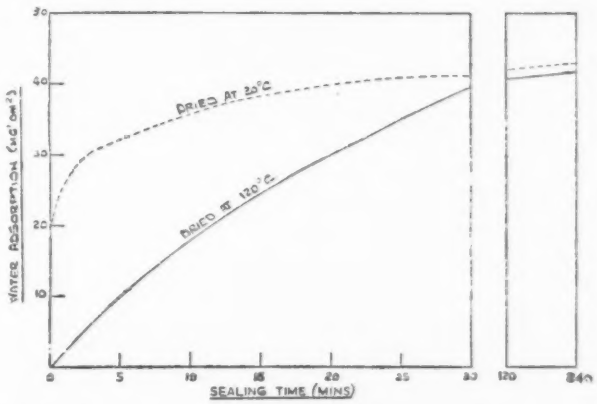


Fig. 1. Effect of sealing time on "real" and "apparent" water absorption by sulphuric acid coatings. Water absorbed in coating dried at 120° C. corresponds to the formation of $Al_2O_3 \cdot H_2O$.

This is a slow process and the amount of water held in this way reaches its maximum only after a time (see Fig. 1). Thus, complete sealing at near 100°C. averages about 30 minutes and is a function of the film thickness and porosity, i.e., of the anodizing conditions. It may be hastened by the addition of neutral alkali salts or capillary active substances[3] such as asymetric dimethyl or ethylene-diaminehydrochloride.[4] Table II and Fig. 1 shows the effect of sealing time on the water absorption of the film, while Table I shows the relation between thickness of the anodic film and water content after sealing.

Alternatively, steam can be used for sealing[7] in which case the best results are achieved by placing the work in a vacuum before entry of the steam.

TABLE I — *Relation Between Thickness and Water Content in Sealing*[6]

(a) in distilled water at 100°C., 30 min.
(b) in distilled water at 100°C., 240 min.
(c) in 2 per cent nickel ammonium sulphate 95°C., 15 min.

Anodizing Time in minutes d.c. H_2SO_4, 18°C. 2 amp./sq. dm.	*Film Thickness (μ)*	*Water Content (gm./sq. m.) after Sealing* a	b	c
5	2.5	0.7	1.0	0.9
15	8.4	0.8	2.0	1.9
30	13.4	3.1	3.6	2.7
60	25.9	6.5	6.6	5.7
120	42.4	28.5	31.3	24.7
240	44.8	29.0	24.3	23.7

TABLE II — *Effect of Sealing Treatments*[5]

Sealing Solution	pH	Sealing Time (min.)	Increase in wt. on sealing (mg./sq. dm.)	CrO_4 absorbed (mg./sq. dm.)	Increase in wt. due to absorption of CrO_4 (mg./sq. dm.)
$K_2Cr_2O_7$ (0.68M)	3.72	20	12.2	6.07	5.23
$K_2Cr_2O_7$ (0.68M)	3.72	20	12.2	6.07	(5.7)
$K_2Cr_2O_7$ (0.34M) + K_2CrO_4 (0.34M)	6.32	5	12.8	3.59	3.1
K_2CrO_4 (0.68M)	8.5	5	14.0	2.17	1.87
Hot water	6-7	5	10.3	—	—
Hot water	6-7	20	13.9	—	—

TABLE III — *Effect of Sealing Treatments*[5]

Sealing solution	Increase in wt. due to hydration (mg./sq. dm.)	Al_2O_3 combined as chromate (mg./sq. dm.)	per cent	Al_2O_3 hydrated (mg./sq. dm.)	per cent	No. of atomic layers of Al combined as chromate	No. of atomic layers of Al (in oxide) hydrated
$K_2Cr_2O_7$ (0.68M)	6.97	5.34	4.46	39.5	32.9	22.8	169
$K_2Cr_2O_7$ (0.68M)	(6.5)	(2.67)	(2.23)	(36.9)	(30.7)	(11.4)	(157)
$K_2Cr_2O_7$ (0.34M) + K_2CrO_4 (0.34M)	9.7	3.16	2.63	55.0	45.8	13.5	235
K_2CrO_4 (0.68M)	12.13	1.91	1.6	68.8	57.3	8.1	293
Hot water	10.3	—	—	58.4	48.6	—	250
Hot water	13.9	—	—	78.7	65.6	—	37

Values in brackets assume formation of the oxychromate, others of oxydichromate.

TABLE IV — *Effect of Chromate Absorption on Corrosion Resistance in Dichromate Sealing at Various pH Values*

pH solution	Gain in wt. (mg./sq. dm.) Hydration	Gain in wt. (mg./sq. dm.) Chromate (as CrO_4)	Chromate Leached by 3 per cent NaCl solution (mg./sq. dm.)	Per cent of original CrO absorbed	Per cent of total gain in weight	Chromate remaining after Leaching	Corrosion Resistance. Loss in wt. in NaCl + H_2O_2 after 10 days (mg./sq. dm.)
3.7	6.1	6.07	4.59	75.6	37.7	0.50	103
6.32	9.7	3.59	1.33	42.1	10.4	0.87	30
8.5	12.1	2.17	0.312	14.4	2.23	0.71	47

In another patent, the anodized parts are rinsed and then dried at 88°-100°C. for 10 minutes before sealing in boiling water.[8]

Hot water sealing provides good protection against corrosion and does not affect the color or appearance of the film.

Dichromate Sealing

This process was first patented by Dunham in Britain[9] and by Edwards in the U.S.A.[10] for sealing sulphuric acid anodic coatings and chemical oxide coatings produced by the Alrok process. Dichromate sealing has become very popular for non-decorative purposes. It gives the coating a yellow color and is, therefore, often unsuitable for decorative applications unless used for a short time at low concentration.

The corrosion-inhibiting properties of the chromate incorporated in the coating were at first believed to be the prime factor in the sealing process. Thus, Edwards in his patent states that dichromate is to be preferred to chromate as the coating will absorb twice as much hexavalent chromium from solutions of the former. Later evidence has shown, however, that the chromate absorbed is only one of the factors involved. Thus, Schenk[6] goes so far as to say that as the dichromate, which he assumes is converted in the coating to a basic aluminum chromate, is absorbed only loosely and as the pores are not completely closed, it is leached out when in contact with water, with the result that for work subjected to moist exposure conditions, dichromate sealing is actually inferior to hot water.

Much, however, depends upon the composition of the dichromate solution employed. Dichromate sealing is really a combination of two processes, viz. (1) the absorption of chromate, which is provided by low pH solutions, and (2) the closing of the pores by the normal hot-water sealing, which also locks the Cr^6 in the pores and which takes place best at higher pH values (above pH 6). The corrosion resistance is a function of the closing of the pores and the re-

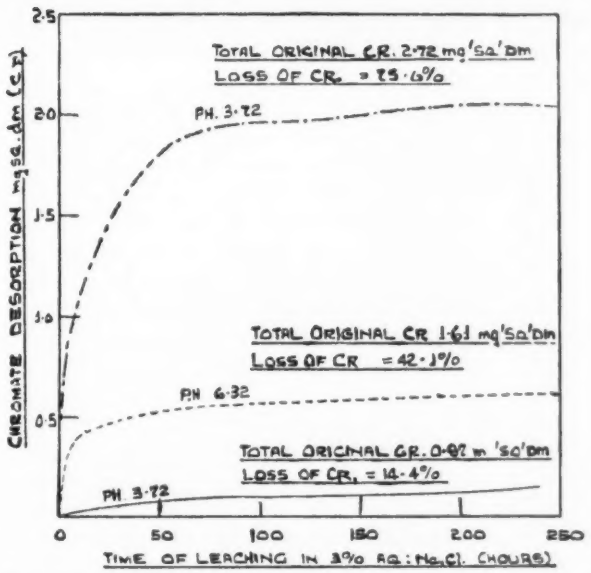


Fig. 2. Rate of chromate desorption in aqueous 3% NaCl of sulphuric acid coatings sealed in chromate-dichromate solutions at different pH values.

sistance of the absorbed chromate to leaching (see Table IV. The importance of the latter will, however, depend on the type of exposure; in dry conditions, pH of the sealing solution is less important.

The inhibitive effect of the chromate is particularly useful as a protection against stress corrosion in the duralumin-type and other high-strength alloys, especially where there is danger of traces of sulphuric acid remaining after anodizing. The older sealing method, now however, largely replaced by the method given below, used to be immersion for 30 minutes in a 5 per cent potassium dichromate solution, free from chloride and sulphate. In the case of decorative anodizing, the dichromate-sealed coating is sometimes rinsed in hot water.

An important contribution to the knowledge of the mechanism of dichromate sealing has been made by Tomashov and Tyukina,[5] who developed an accelerated method which has found large-scale application in the U.S.S.R. and which has recently been adopted as a standard process in England.[11] These authors worked on the Alclad duralmin-type alloy and investigated dichromate and chromate mixtures ranging from pH 3.7 to 8:5, the solution being 0.68M with respect to chromium, i.e., equivalent to 10 per cent potassium dichromate. The corrosion resistance was determined as well as the changes of weight of the coating (see Fig. 2).

The increase in weight of the coating during sealing was very rapid in the first few minutes between

$$\text{pH 6.64, ratio } \frac{\text{chromium as } Cr_2O_7^{--}}{\text{chromium as } CrO_4^{--}} = \tfrac{1}{3}$$

and

$$\text{pH 6.32, ratio } \frac{\text{chromium as } Cr_2O_7^{--}}{\text{chromium as } CrO_4^{--}} = 1$$

and complete sealing was obtained in 5 to 10 minutes. The authors assume that, because of the rapid rate of sealing, complete pore closure is achieved in the first 5 to 10 minutes as a result of the expanding $Al_2O_3 \rightarrow Al_2O_3{\cdot}H_2O$, the rate of the diffusion process being markedly reduced with a reduction of the cross-section of the pores and hence the true surface area of the film.

This increase in sealing rate is even more rapid at higher pH values, e.g., at pH 9.0 (CrO_4 + 0.05 % Na_2CO_3), but a maximum is reached at 2 minutes after which there is a reduction in weight due to dissolution of the film in the alkali solution. The latter occurs also with pure chromate solution (pH 8.5). At the higher pH values, hydration is greater and a denser film is obtained:

$\rightarrow$ 33 per cent increase in volume of oxide,
Al_2O_3 (s.g. 3.42) $\rightarrow$ $Al_2O_3{\cdot}H_2O$ (s.g. 3.014)

From the pH change during sealing which rises with increasing surface area of anodized work treated, the authors deduce that absorption is not molecular, but is an anion exchange which results in liberation of one equivalent of alkali for the dichromate, forming aluminum oxydichromate:

$$OAl-OH + KHCrO_4 \rightleftharpoons OAl-HCrO_4 + KOH$$

accompanied by reaction leading to the oxychromate

$$\begin{matrix} OAl-OH \\ \quad + KHCrO_4 \rightleftharpoons \\ OAl-OH \end{matrix} \quad \begin{matrix} OAl \\ \quad CrO_4 + KOH + H_2O \\ OAl \end{matrix}$$

This theory was confirmed by determination of the ratio of liberated alkali to absorbed chromate (approximately 2.72 mg. Cr per sq. dm. of sealed apparent surface area of film) which was approximately

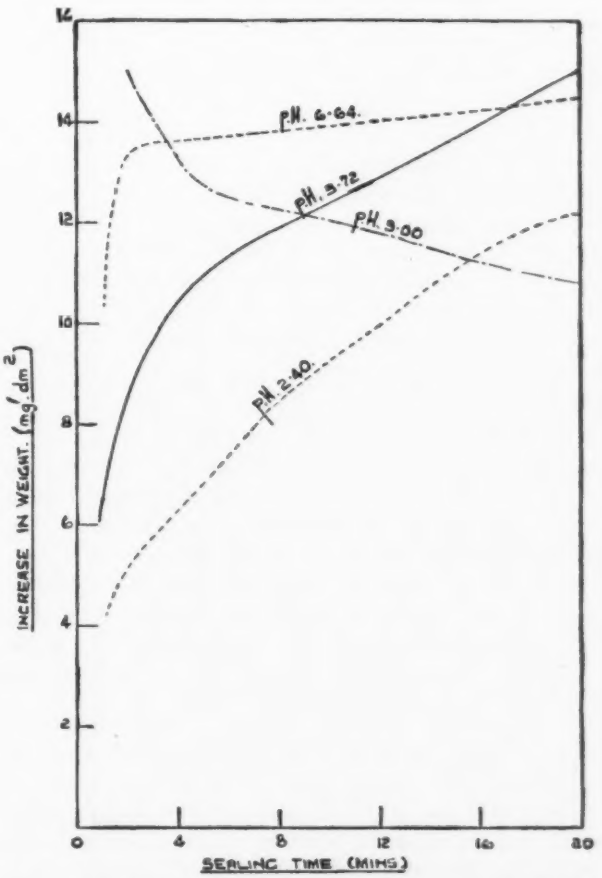


Fig. 3. Effect of sealing time on weight increase of sulphuric acid coatings sealed in chromate-dichromate solution at different pH values.

TABLE V — *Effect of Sealing Treatments on Corrosion Resistance and Mechanical Properties of Anodized Hiduminium 266 (D.T.D. 646B)*[12]

Anodizing Process	*Sealing*	*Exposure to Salt Solution fog (days)*	*Ultimate Tensile Strength (mean of 3)*	*Elongation per cent on 2 in (mean of 3)*	*Loss in wt. mg./dm./day (mean of 3)*
None	—	—	31.0	9.3	—
"	—	57	21.03	0.2	15.78
CrO_3	—	509	21.0	1.8	2.62
"	—	57	25.17	0.75	5.54
H_2SO_4	Boiling H_2O (30 min.)	509	19.2	1.2	1.50
"	Normal $K_2Cr_2O_7$ (30 min.)	509	30.5	8.0	Trace
"	Rapid method (1)	509	30.1	6.8	Trace
"	Rapid method (2)	509	30.3	7.8	None
"	$K_2Cr_2O_7$ then $ZnCrO_4$ (30 min.)	509	30.4	7.8	Trace
"	$ZnCrO_4$ then $K_2Cr_2O_7$ (30 min.)	509	30.0	8.2	Trace
"	Cobalt acetate (30 min.)	509	30.3	10.0	0.42
"	Nickel acetate (30 min.)	509	29.9	9.2	0.40
"	Na metasilicate:				
	$Na_2O : SiO_2 = 1 : 1$ (30 min.)	57	19.9	0.6	14.01
	Sodium silicate:				
"	$Na_2O : SiO_2 = 1 : 2.05$ (30 min.)	509	11.4	0.3	4.92
"	$Na_2O : SiO_2 = 1 : 2.65$ (30 min.)	509	30.4	9.8	0.47
"	$Na_2O : SiO_2 = 1 : 2.91$ (30 min.)	509	26.8	4.3	0.42
"	$Na_2O : SiO_2 = 1 : 3.0$ (30 min.)	509	29.4	6.3	0.57
"	$Na_2O : SiO_2 = 1 : 3.3$ (30 min.)	509	30.4	8.7	0.41
"	$Na_2O : SiO_2 = 1 : 3.4$ (30 min.)	509	30.5	7.0	0.61
"	$Na_2O : SiO_2 = 1 : 3.4$ cold sodium silicate then HAc	509	5.0	0.3	8.12

1:1. The oxydichromate is assumed to be formed in more acid solutions, and the oxychromate in the higher pH ranges.

Both of the reactions are reversible, and with increase of hydrogen-ion concentration (lower pH) the equilibrium is shifted towards the right. Leaching takes place then the oxychromate is hydrolyzed, i.e., a shift towards the left. In neutral solution this is slower as chromate is less easily hydrolyzed than dichromate, added to the impeding effect of the more rapidly and completely closed pore space by hydration in solutions of higher pH.

The best corrosion resistance is obtained at pH 6 to 7 and, as can be seen from Table IV, which is compiled from Tomashov and Tyukina's results, the corrosion resistance as determined by loss in weight on immersion in an oxidized salt solution is not primarily related to the amount of chromate absorbed, which falls off with decreasing pH, but to a combination of the degree of hydration, together with that proportion of chromate which is locked in the pores (see Fig. 3), and hence is resistant to leaching, the latter being a function of the former as well as of the amount of chromate initially absorbed. In the low pH solutions, the major factor influencing corrosion resistance is the degree of hydration, which to some extent is prevented by chromate absorption. It must not, however, be forgotten that corrosion results apply to exposure to aqueous solutions only.

In practice, the authors recommend the following two solutions:

(1) For the highest corrosion resistance:

$K_2Cr_2O_7$	100 g.,	90° to 95°C.
Na_2CO_3	18 "	2 to 4 minutes or up to
or NaOH	13 "	10 minutes
H_2O	1 liter	
pH	6-7	

(2) For a reduced chromate consumption:

$K_2Cr_2O_7$	15 g.,	90° to 95°C.
Na_2CO_3	4 "	2 to 4 minutes or up to
or NaOH	3 "	10 minutes
H_2O	1 liter	
pH	6.5-7.5	

If sodium carbonate is used, the solution should be boiled to drive off the carbon dioxide. With each addition of 100 g. $K_2Cr_2O_7$, 18 g. Na_2CO_3 should be added to solution (1) and 27 g. Na_2CO_3 to solution (2) to keep up the pH.

The suitability of the method has been confirmed in production on Al-Mn, Al-Mg and Al-Si and duralumin-type alloys as well as on clad alloys. The results have been confirmed by corrosion resistance tests carried out by Whitby[12] (see Table V).

Recently D.T.D. 910C has recommended solution (1) at pH 6-7 described above used at 94°-98°C. for 5- 10 minutes with the alternative of the older type of solution containing potassium or sodium dichromate 45-55 g./l.

The pH in the concentrated solution (1) may be determined by using bromthymol blue and in the more dilute solution, by using bromcresol purple as indicator, or by the electrometric method. (Note: The

pH values given by the colorimetric method are 0.3-0.4 unit higher than those obtained with the glass electrode.)

Sodium Silicate (Waterglass) Sealing

This method of sealing, which has been already described as the sealing process used for M.B.V. chemical oxide coatings, was also first patented by Dunham in Britain[9] and by Edwards in the U.S.A.[13] It is, however, less important than dichromate sealing for anodic oxide films. Edwards states that an Na_2O : SiO_2 ratio of 1 : 3 or higher is preferable, or, in the case of potassium silicate, $K_2O : SiO_2 = 1 : 4$. Anodized coatings sealed in this way lost 5.3 per cent of their elongation value after exposure to 20 per cent salt spray for 52 days as against 4.5 per cent when dichromate sealed or 16 per cent when left unsealed. Further comparisons are seen in Table V.

According to Schenk,[6] the sodium silicate used has a Na_2O : SiO_2 ratio around 1 : 3.86 and the silicate acts as an inhibitor to weak alkali solutions. A modification of this treatment, in which the work is first sealed in waterglass and then immersed in dilute acetic acid, was at one time used on diecastings but is not now recommended.

In the corrosion tests carried out by Whitby[12] in 3 per cent salt solution fog, the optimum soda-silicate ratio corresponds to roughly $Na_2O : SiO_2 = 1 : 3.3$, and this author believes that aluminum silicate is formed by the action of the precipitated silicic acid on the aluminum hydrate or by double decomposition of sodium silicate with aluminum sulphate in the sulphuric acid anodic coating.

Above a Na_2O : SiO_2 ratio of 1 : 2.9 the solution is neutral, below this range it is alkaline; e.g., the metasilicate with a ratio of 1 : 1 is not suitable nor are silicates of ratio below 1 : 2.9. The sealing solution is normally used with a sodium silicate content of approximately 5 per cent at 90° to 100°C. for 30 minutes.

Coating with an alkali metal or organic silicate followed by a coating of a polyorganohalogenopolysiloxane has been suggested for protecting anodized aluminum against icing by lowering the adhesion of ice to the surface.[14]

Sealing by Salt Hydrolysis

The most important of these processes involves the use of nickel and cobalt salts. The salts are absorbed into the coating where they are hydrolyzed and precipitated as the hydroxide. As nickel and cobalt hydroxides are almost colorless in small amounts, this method is very suitable for sealing dyed coatings. Whitby found that it was more effective than hot water sealing, though rather less so than dichromate sealing. There was little or no difference between the nickel and cobalt salts, which can also be used together,[13] e.g.:

Nickel acetate	5 g./l.	15 to 20 min.,
Cobalt acetate	1 "	90°C.
Boric acid	8 "	pH 5 to 7.

The nickel or cobalt solution should be used at pH 4.5 to 7.5 and may (as above) be buffered with boric acid. Alternatively, nickel sulphate or nitrate may be used instead of the acetate while the double sulphate with ammonia has also been used. After sealing, the work is frequently additionally immersed in hot water.

The solution should show some turbidity when boiling.

Combined Sealing and Dyeing

In the production of dyed coatings it has been found possible to combine the sealing and dyeing process, either by raising the temperature of the dye bath or by means of additions such as 0.5 per cent potassium dichromate to a dyeing bath operated at 82°C. for 15 to 20 minutes[15] in which the dichromate is present in too small an amount to affect the color of the coating. This is the Dialumin process. Alternatively, capillary active substances may be added to some dye baths.[16]

After dyeing and sealing sulphuric acid coatings in nickel or cobalt solution, the work is frequently polished by a light buffing, using a flannel buff.

Dyed Chromic Acid Coatings

These may be sealed either in nickel or cobalt solution or, alternatively, may be impregnated with organic mixtures.[6] For this purpose lanolin in benzene may be rubbed on to the surface with a cloth, or other mixtures may be applied, including:

(a)	Beeswax	6 oz.
	Carnauba wax	25 oz.
	Turpentine	1 gal.
(b)	Stearic acid	6 oz.
	Carnauba wax	6 oz.
	Turpentine	1 gal.

Comparison of Sealing Processes

In decorative anodizing, where a colorless transparent anodic film is applied, e.g., over a polished surface, the coatings are generally sealed in hot water. Where the coatings are dyed, the usual method of sealing is in nickel or cobalt acetate, though, in some cases, potassium dichromate may be used without affecting the color.

Hot water sealing is not, in general, recommended for sealing porous coatings which have been produced by the sulphuric acid process, as corrosion spots are liable to develop. Potassium dichromate is effective in preventing this.

In the majority of applications, the best corrosion resistance is obtained by the potassium dichromate sealing solution; sodium silicate is not as effective, though it is generally considered superior to hot water sealing. The Tomashov and Tyukina rapid dichromate sealing method described above produces results at least as good as the ordinary 30-minute treatment, while they are superior where the coatings are exposed to the leaching effect of rain water, etc.

Whitby,[12] who measured the effect, on the corrosion resistance and on mechanical properties such as tensile strength and elongation, of various sealing treatments on sulphuric acid anodized coatings on a duralumin-type alloy, D.T.D. 646B, after exposure to salt solution fog (see Table V), found that the best results were obtained with the Tomashov and Tyukina method, while after 30 minutes in boiling water, the loss of tensile strength and elongation was rather more than in the case even of unsealed chromic acid coatings.

Schenk,[6] however, who compared the loss in weight

TABLE VI — *Effect of Sealing Treatment on Resistance of Anodized 99.4% Al Sheet to Rotating Salt Solution for 27 Days*

Anodizing: 20% H_2SO_4, 27°C., 1.25 amp./sq. dm., 30 minutes

Sealing Treatment	*Loss in wt. (gm./sq. m. /day*	*Appearance*
Lacquer	9	Corrosion only on edges, film unchanged
Glauber salt soln.	14	Strong corrosion on edges, slight corrosion spots
Hot water	21	Corrosion spots, film slightly darkened
Ni-ammonium sulphate	41	Corrosion edges and locally on film. Film matt and rough
$Na_2Cr_2O_7$ soln.	116	Film destroyed, strong local general corrosion

after exposure of sealed films to a rotating salt solution (see Table VI), found that sulphuric acid coatings sealed in sodium dichromate lost almost six times as much in weight as films sealed in hot water or almost three times as much as films sealed in nickel-ammonium sulphate solution. Allowing for the effect of slight difference in anodizing conditions and metal composition, such conflicting results are an example of the inadequacy of many of the standard accelerated corrosion tests. The exposure conditions used by Schenk are certainly very much more severe and, despite the fact that his basis metal is rather more corrosion resistant, his coatings sealed in hot water lost 140 times as much weight per day as Whitby's. It is further clear that, in the standard low pH dichromate sealing treatment used by Schenk, the dichromate is leached by contact with the salt solution, and the test is misleading as a guide to the corrosion resistance of a coating subjected to ordinary weather exposure.

It may also be remarked that various authors are in disagreement also concerning the relative merits of the hot water-sealed sulphuric acid coating and unsealed chromic acid coating, to give only one example, and there is scope for further experiments using a great variety of exposure conditions, as well as on the effect of alloy composition, the state of the surface treated, e.g., its roughness, and the properties of the anodic coating itself. Further results of corrosion tests of sealed coatings will be given in a general discussion of the corrosion resistance of anodic coatings in the next installment.

The aluminum hydrate $Al_2O_3 \cdot H_2O$ is markedly softer than the oxide and where the maximum hardness and abrasion resistance are required, anodic coatings are generally left insealed or else protected by an organic lacquer. Among the chemical sealing treatments, the inorganic salt solutions are generally better in this respect than hot water sealing.

Organic Materials

The use of organic substances such as lacquers, waxes or resins is not now popular and they are rarely used for sealing except on chromic acid films. They act by imparting a superficial impervious layer on top of the coating and may often be employed as an additional protection. One of their disadvantages is that they are easily dissolved by organic solvents.

However, petrolatum is sometimes applied to the anodic coating and in such cases this may be done as an additional protection after hot-water sealing. It can be applied by hand or by a method recently described by Briese[17] can be used. In this method, the work is taken out of the anodizing bath, rinsed for 2 minutes, dipped in sodium carbonate solution for 1 minute and subsequently into a bath of petrolatum, held at 160°C., for 2 minutes. After this the work is drained and cooled.

According to Briese, the improvement in service life obtained by using this method is five times that of single hand application after hot-water sealing.

Alternatively, the anodic oxide coating may be impregnated with organic compounds in the vapor phase. In one such process,[18] sulphuric acid-anodized aluminum is exposed to one of the following mixtures: Phenol or urea-acetaldehyde; phthalic anhydride-glycerol; styrene-furfuryl alcohol. The process is carried out in a closed container above 200°F. when the vapors polymerize to form a monomeric synthetic resin within the coating.

Stripping Anodic Coatings

Three stripping solutions are in common use for removing anodic oxide coatings. These are:

(i) Phosphoric acid (d. 1.75) ..... 35 ml./l.
Chromic acid ..... 20 g./l.
Used at boiling point.

(ii) Sulphuric acid (conc.) ..... 100 ml./l.
Potassium fluoride ..... 4 g./l.
Used at room temperature.

(iii) Sulphuric acid (conc.) ..... 100 ml./l.
Hydrofluoric acid (commercial 50/60% HF) ..... 10 ml./l.
Used at room temperature.

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Finishing Pointers

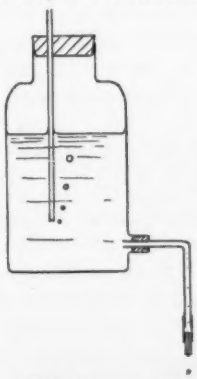
Continuous Addition to a Plating Bath

CONTINUOUS addition of chemicals to a plating bath will sometimes simplify control procedures. This is particularly true where the life of the chemical is short. If the chemical is unstable or reacts readily with the bath, it may be desirable to keep as small an amount as possible always present. Continuous addition will solve such a problem.

In some instances the rate of decomposition of a chemical is proportional to the concentration, so that large additions will not have a much longer life than small additions. Addition of hydrochloric acid to an iron chloride bath is an example. A small amount of acid is necessary to keep the iron in the reduced state. However the free acid is used by chemical solution of the anodes and, if excess acid is added, it will have a short life. By making occasional additions, the acid consumption is high and the condition of the bath is constantly changing. By making continuous additions, acid consumption can be kept low and fluctuations in the acid content can be minimized.

Another application is that of addition agents. Addition agents generally do not have to be added oftener than once a day, in which case continuous addition is not desirable. However, if more frequent additions are required or, possibly, if frequent additions are required to a fresh bath, then a method for continuous addition will be useful.

The sketch shows a simple method for making continuous additions. A bottle is fitted with an outlet tube, a constriction at the bottom of the outlet tube and a breather tube. The flow from constricted tip is determined by the head of liquid which is the height from the tip to the bottom of the breather tube. The flow will be constant as long as the liquid level does not drop below the bottom of the breather tube.



The flow can be adjusted by changing the head, either by changing the height of the tip or by changing the height of the breather tube.

The flow is directly proportional to the head. If the head is doubled the flow will be doubled. Therefore, if the flow is determined at one head, the head can be calculated to obtain any other flow. The table shows calibration data and the determination of a constant to calculate the flow for any head. The equation is simply:

$$\text{Head} = \text{Flow} \times K$$

A tip made from capillary tubing can be selected to obtain almost any desired flow rate. The tip for the data given was made by heating a ¼ inch glass tube with a 1 mm. bore and pulling it to about 10% of the original cross section. Such a tip will have a 0.1 mm. opening and will give a flow rate of about 2 liters per day. The flow will vary approximately as the diameter of the opening. On this basis a 1 mm. opening would give 200 liters per day at the same head. By selection of the proper size opening and the proper head it is possible to obtain almost any desired degree of flow.

One difficulty is encountered. For the small flow rates that are likely to be desired a very small opening is required in order to take advantage of a sufficient head to make adjustment easy. Such small openings easily become plugged. Although they can be readily opened with a small wire they will frequently be stopped in the presence of small particles. Due to this condition, it is essential that the flow equipment and bottle be completely clean. And, it is also necessary to use a solution that is free of suspended material. This usually means that the solution must be filtered. Particles of colloidal, or very small size will not cause trouble. Consequently, filtration with a fast filter paper or a fairly open filter medium is satisfactory. This means that filtration can be rapid.

It is well to have a valve on the outlet line so that the flow can readily be stopped or started. Also, it is not necessary to use a bottom outlet bottle as shown. The outlet line can consist of a siphon over the edge of the bottle. However, in any case, the bottle must be closed if it is desired to use a breather tube to obtain a constant head.

If the flow does not have to be constant, but only approximate, then a siphon line can be used and, by having the tip well below the bottom of the container, the variation in flow rate can be held to a minimum. This variation can be easily estimated from K. Such a method was used in one application to continuously add hydrochloric acid directly from a carboy to an electropickle. By selection of a proper tip and head the carboy was emptied in 16 hours.

By use of the apparatus described, chemical solutions can be added to plating baths at continuous and accurate flow rates.

Flow at Various Heads

Head Inches	*Flow cc/min.*	*K*
20	1.80	11.1
18	1.20	10.6
16	1.54	10.4
14	1.27	11.0
12	1.08	11.1
10	0.93	10.8

Covering Power in Chromium Plating Baths

Influence of the Five Independent Variables

With Particular Reference to the Interdependence of Temperature and Mean Current Density

By Robert H. Rousselot, *French National Center for Scientific Research, Electrolysis Laboratory, Paris, France*

Introduction

THE covering power of a plating bath is defined as the minimum current density at which the metal deposit begins to form. For the electrochemist, this corresponds to the minimum discharge potential of the particular metal ion.

In a chromic plating bath, in contrast to most electrolytic baths, the covering power is highly sensitive to a large number of factors. In a previous article,[8] we described a simple method of determining covering power quantitatively by the use of bent cathodes in the Hull cell — a method that takes all the factors into account.

Specifically, we have only to measure the length of the chromium deposit that is obtained on the cathode under given conditions and express this length in terms of current density by reference to the calibration curves of the cell,[8] or by means of the general equation for these curves:

$$i = I\ (2.80 - 3.88 \log \times).$$

An accurate quantitative evaluation of the effects of some of the main factors having already been made possible by this method, we wish to review briefly in Part I what is now known regarding the influence of the various factors on covering power, and then, in Part II, show how the method we suggest can be used to clarify certain other points.

PART I

General Influence of the Five Variables

CLASSIFICATION OF FACTORS AFFECTING C.P.

It is known that these factors are of two kinds:

1. Those relating to the basis metal, its surface condition, and its preparation before plating.
2. Those relating to the composition of the bath and the operating conditions.

The first group of factors have to do chiefly with the preparation of the piece to be plated and are, therefore, of less direct interest in the actual plating process. Since their effect has already been studied,[1] we will confine ourselves to the second group of factors.

VARIABLES IN A CHROMIUM BATH.

There are seven different factors which affect the operation of a chromium plating bath, breaking down into five independent variables:

1. Chromic acid (CrO_3) concentration
2. Sulfuric acid (H_2SO_4) concentration
3. Trivalent Chromium (Cr_2O_3 or Cr^{+++}) and iron (Fe^{+++}) concentrations
4. Temperature (T)
5. Mean Current Density (J)

and two dependent variables:

6. Covering power (C.P.)
7. Cathode efficiency (Ec)

The relative importance of these last two factors is of course not the same, since the main objective in the operation of a chromium plating installation is to obtain a good covering power†, while the cathode efficiency is of secondary importance unless it is abnormally low.

Moreover, cathode efficiency has meaning only with reference to a definite current density and can, therefore, only be measured in a cell forming a linear conductor‡. It is of interest to the electrochemist only when he knows the current distribution on the pieces he is plating.

We will not, therefore, discuss the question of cathode efficiency, with which we are not specifically concerned in this article, and will devote our attention to the effects of the five independent variables on covering power.

The Five Independent Variables

Strictly speaking, the first five variables we have mentioned are independent because no one of them depends on another and because a specific value could be attributed to each. The covering power would then have a well-defined value somewhere between the ab-

A paper presented at the Annual Conference of the French Hard Chromium Platers' Assn., Paris, 1955.

†From the standpoint of expression, we will distinguish between the covering power and its numerical value, because a good covering power has a low numerical value. We therefore speak of an increase of covering power when its value actually decreases.

‡A table of cathode efficiencies measured under these conditions, as a function of current density and temperature, is given in reference 2. It illustrates the two basic conclusions on variations of cathode efficiency:

Ec increases as T decreases

Ec increases as mean current density increases

solute minimum and infinity (no deposit at all). However, if an acceptable covering power is to be obtained, the range of each variable is greatly reduced, some variables are rather strictly limited by the values of others, and economical and practical considerations have a bearing.

In order to obtain the best covering power possible, it is therefore important to know the effect of each separate variable.

CrO_3 CONCENTRATION:

The optimum C.P. value increases slightly with increased concentrations of CrO_3 — an argument for medium or weak solutions. On the other hand, the isochromes widen with this concentration and offer a wider range of possible variations for the sulfuric acid concentration of the bath[8] — an argument for medium to strong concentrations. If we also consider the necessity of avoiding the heavy drag-out losses which would result from a strong concentration of chromic acid, we must conclude that a medium CrO_3 concentration, about 300 grams per liter (g./l.), is preferable.

In practice, the variations in chromic acid concentration are due to the fact that the metal deposited comes from the solution itself and not from anodes, and that the drag-out losses are great. Accordingly, the CrO_3 concentration always tends to decrease. An examination of the isosulphates[8] shows that the CrO_3 depletion of the bath induces an increase in the C.P. value along the low-slope part of the curve. There is, therefore, no reason for an abrupt variation along the high-slope part, resulting from an excess of chromic acid. It is, however, necessary to replenish the bath frequently on the basis of a statistical record of chromic acid consumption, in order to keep it in the best operating condition.

H_2SO_4 CONCENTRATION:

There is much less latitude in deciding the sulphuric acid concentration of a bath once the first variable, CrO_3, is chosen. The isochromes show in a general way that, as the H_2SO_4 concentration is increased, the covering power passes an optimum that is characteristic of the given isochrome, and then increases more or less rapidly.

For a given chromic acid concentration, the range of possible H_2SO_4 concentrations is therefore rather narrow. It should be a little above the optimum and never below it. For example, for a CrO_3 strength of 310 g./l., the H_2SO_4 concentration should be:

From 2.10 to 2.30 g./l., when $Cr^{+++} = 0.50$ g./l.
and From 2.40 to 2.60 g./l., when $Cr^{+++} = 1.50$ g./l.

It has become a widespread practice to express this optimum by the CrO_3/H_2SO_4 ratio and to say that it should generally equal 100. Not only does this ratio not equal 100 for medium chromic acid concentrations, but it varies greatly with the CrO_3 concentration[8] and also depends, as we have just seen, on the trivalent chromium concentrations. It is preferable, therefore, to abandon this rule-of-thumb ratio, and give both the chromic acid and the sulfuric acid concentrations corresponding to the optima. (See Appendix I.)

In an industrial bath, the only possible variation in sulfuric acid concentrations is from drag-out losses, which might cause a rapid increase of the covering power value along the vertical part of the isochrome. These losses may be compensated for by preceding the chromium plating bath with a warm rinse of the same sulfuric acid concentration as the bath itself.

Cr_2O_3 AND Fe CONCENTRATIONS:

Obviously, these two concentrations are not chosen. They result from the operation of the bath over a long period of time.

Reports on the effects of these two variables on covering power are practically non-existent in chromium plating literature. However, we called attention to the fact that trivalent chromium and iron in small quantities appeared to make the isochrome smoother and wider.[8] It appears, in the light of experience, that the amount of sulfuric acid should be increased as the trivalent chromium and iron concentrations increase. Apparently the Cr^{+++} and Fe^{+++} ions engage some of the SO_4^{--} ions in complexes at the expense of the Cr^{VI} and SO_4^{--} complex, which makes it necessary to increase the H_2SO_4 concentration in order to maintain the optimum.

TEMPERATURE:

We know that the covering power deteriorates (its value increases) as the temperature is raised. It is therefore better to choose a fairly low temperature,

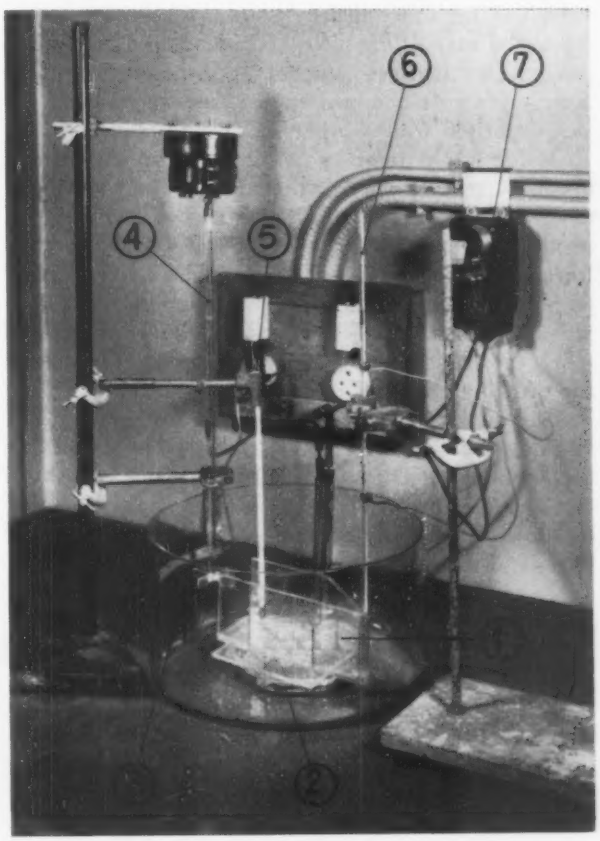


Fig. 1. Apparatus used with the immersion-type Hull Cell (the conventional plating circuit has been eliminated for purposes of simplicity).

1. Immersion-type Hull cell.
2. Heating resistance.
3. Lead anode.
4. Stirring rod.
5. Thermometer.
6. Thermostat controlling the temperature through relay (7).
7. Relay controlling the resistance (2).

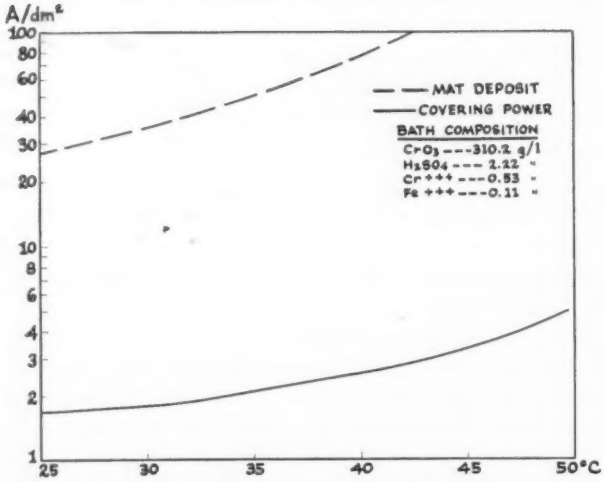


Fig. 2. Curves showing covering power and dull deposit in a chromium plating bath recently put into service. Coverage is not very good at low temperature but somewhat better at high temperature.

particularly since the cathode efficiency is also better. However, the protruding parts of pieces of complicated shape are more easily "burnt" at low temperatures. In such cases a high temperature must be chosen, depending on the shape of the pieces to be plated.

MEAN CURRENT DENSITY:

While raising the MCD does not change the C.P. value, as we have already shown,[8] it does increase the plated area of the pieces (the length covered when referring to the bent cathode) and, therefore, enables a deposit to be obtained in recesses where no metal was deposited with a lower mean current density.

On the whole, these two variables, temperature and mean current density, although intrinsically independent, are closely associated from the standpoint of results. Surprising as it may appear, no author has formerly associated these two variables in their effect on the area covered by the chromium deposit. This was a serious gap and the bent cathode method seemed to be the most likely for overcoming it or, at least, for providing data of practical interest.

After reviewing the effects of the five independent variables on covering power, it appeared interesting to examine the interdependence of temperature and mean current density in relation to the length covered by the chromium plate. This problem is dealt with in Part II of this article.

PART II

Interdependence of Temperature and Mean Current Density in Relation to the Covered Length

Using bent cathodes in a Hull cell makes it possible to obtain quantitative covering power values. This method could, therefore, be used to determine the relationship between covering power C.P. and the temperature of the bath T, all other factors being constant.

Unfortunately, at temperatures above, say, 40°C., it is difficult to keep the temperature of such a small bath constant during the three minutes of the plating test.

We must therefore use the immersion (hanging) type of Hull cell[3]: an ordinary Hull cell with parallel sides extended to measure 100 mm. and 180 mm. respectively, and the anode wall eliminated. This cell is submerged so that the solution level (which must never go over the top of the cell) is the same as in the regular cell, that is, about 50 mm.

The advantages of the immersion cell are as follows:

1. Because of the extended sides, the anode may be situated anywhere outside the cell without altering the current distribution on the cathode.

2. The virtually unlimited volume of the bath in which the cell may be placed makes it possible to keep the temperature reasonably constant.

The experimental apparatus used with the immersion Hull cell is shown in Fig. 1. The cell is placed in the center of a crystallizer, where it rests on a perforated Plexiglass plate, beneath which is a resistance heater. This heater is controlled by a thermostat with a relay to switch it on or off whenever the temperature varies from the assigned value by 0.2°C. The stirring rod helps to maintain a uniform temperature throughout the bath. The vertical anode may have any dimensions desired. It has been placed in front of the open side of the cell but, as we have said, it could have been placed anywhere outside the cell proper.

COVERING POWER AS A FUNCTION OF TEMPERATURE:

In order to plot the curve of C.P. as a function of T, all that is necessary, after choosing the factors of the first category (actual factors in a practical case or simple ones in a generalized experiment), is to chromium plate a series of bent cathodes while changing the temperature of the bath in each instance. The basis metal and the surface preparation adopted here are the same as in the preceding report,[8] i.e., polished brass cleaned with trichlorethylene.

The lower curves in Fig. 2 and 3 show how covering power varies with temperature in two commercial baths, the composition of which is indicated. They confirm quantitatively that the value of C.P. increases (the covering power deteriorates) as the temperature rises.

The curve in Fig. 2 (a fairly new bath that does not contain enough Cr^{+++} and Fe^{+++}) shows that this bath plates rather poorly at low and medium tem-

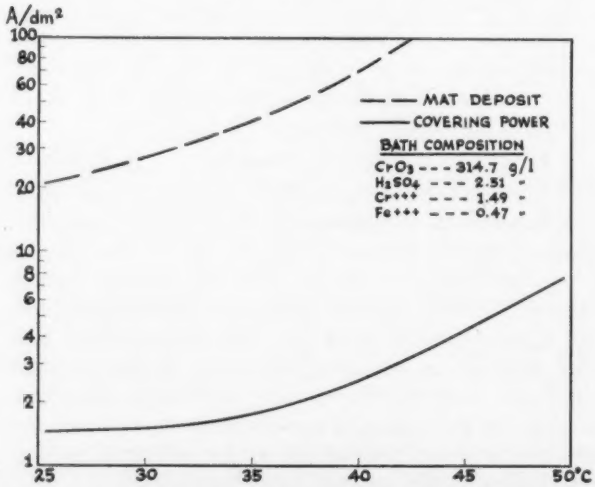


Fig. 3. Curves showing covering power and dull deposit in a chromium plating bath long in service. Coverage is better at low temperature than in new bath.

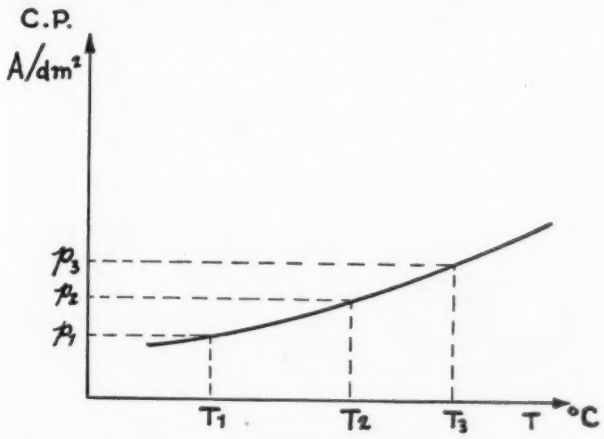


Fig. 4. Covering power (C.P.) as a function of temperature (T) for a given bath.

perature. The curve in Fig. 3 (a bath long in use) shows that it plates better at those temperatures and less well at higher temperatures.

The upper curves show the beginning of the dull deposit (upper limit of the bright range). They have been determined in much the same manner as the C.P. curves, but using a straight cathode and 10 amperes, since we were dealing with high current densities.

The dull deposit curve can be no more than indicative, since the distinction between bright and dull is a matter of the eye. Furthermore, this boundary line is extremely dependent upon the basis metal used and the surface condition.

Nevertheless, it can be seen that the distance between the C.P. curve and the dull deposit curve increases slightly as the temperature rises — which explains why some peculiarly-shaped parts can be chrome plated more easily at higher temperatures. Since both curves are also ascendant, higher current densities must be adopted for higher temperatures — which brings us to the problem of choosing these two variables.

Choice of Temperature and Mean Current Density

The C.P. curves above confirm the fact that temperature has an effect on covering power: when T increases, the value of C.P. increases also.

Moreover, we have seen that mean current density has an effect on the length chromium-plated: when T increases, the length covered l_d, increases.

This distinction regarding the behavior of these two variables is not an idle one. It tells us that the temperature acts on the process of metal ion discharge, whereas the mean current density merely multiplies the secondary current distribution by a constant factor. This will eventually enable us to state the interdependence of T and J.

The simultaneous choice of these two variables is aimed at satisfying the following three conditions, given in their relative order of importance:

1. Metal plating the recesses of pieces, where local current densities are lowest.
2. Avoiding a dull or burnt deposit on the protruding parts.
3. Altering both variable simultaneously (e.g.: reducing the operating time or increasing the speed of deposit) without altering the results.

In general, choosing a temperature and mean current density to satisfy the first two conditions is only possible, in the absence of qualitative data associating the two factors, by empirical practice.

We shall see, however, that, in the light of what has been said above regarding the behavior of the two variables, it is possible, by using the curve of C.P. as a function of T, to solve the problem raised by the third condition.

This problem can be stated as follows:

When a bath of known composition plates an object properly using a current density of J_1 and at a temperature of T_1, what current density must be applied if the temperature is changed from T_1 to T_2 in order that the bath *will ensure the same covering results?* In other words, what relation exists (in this particular bath) so that the recesses of given objects will be chromium plated to an identical extent?

Once this relationship is established for the general case, we shall apply it to an actual bath. This will give us the quantitative data, the lack of which we regretted above, thus facilitating our initial choice of the two variables.

Interdependence of Temperature and Current Density:

Let us consider some specific curve of C.P. as a function of T (Fig. 4). We see that, as the temperature rises from T_1 to T_2, for example, the covering power, C.P., goes from p_1 to p_2, which corresponds to a decrease in the length plated on the bent cathode.

Now let us look at the calibration curves for the cell (Fig. 5). For the covering power, p_1, the length of the plate under a current density of J_1, is x_1.

If we raise the temperature to T_2 (Fig. 4), the covering power becomes p_2, and we see that if we plate under the same current density, J_1 (Fig. 5), the length plated will only be x_2. In order to obtain the original length, x_1, the current density must be higher. The necessary current density is given by the curve passing through the point of coordinates p_2 and x_1, that is, the curve J_2.

Similarly, if the covering power changes to p_3, the current density must be J_3, if the same length, x_1, is to be plated, etc.

Since the plating curves are homothetic by their

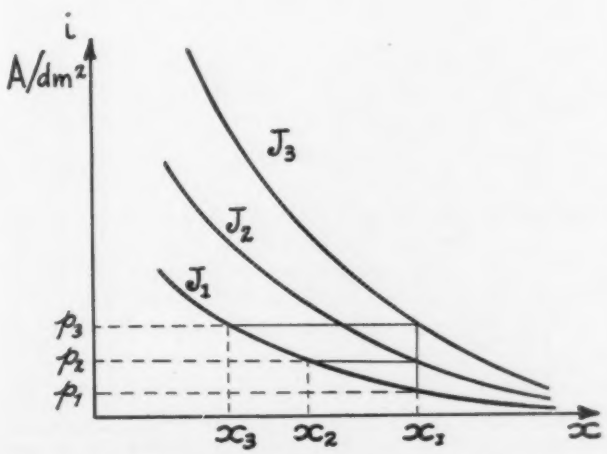


Fig. 5. Diagramatic calibration curves for the cell.

ordinates.* we have the following relationship at the point x_1:

$$\frac{p_1}{J_1} = \frac{p_2}{J_2} = \ldots = \frac{p_n}{J_n} = h_{(x1)}$$

$$\text{and hence, } J_2 = \frac{J_1 p_2}{p_1} = \frac{p_2}{h_{(x1)}}$$

where p_2 is the covering power at T_2 and $h_{(x1)}$ is the homothetic factor for $x = x_1$.

The family of calibration curves may be presented in a handier fashion. Considering the cathode are ½ dm²), the general equation becomes:

$$i = J\,(1.4 - 1.94 \log x)$$

where J is the mean current density across the cell instead of the total current I.

This equation is of the form $i = J \cdot h_{(x)}$, and the whole family of curves may be represented as a straight line, the abscissa being logarithmic and the ordinate being the factor h, by which the mean current density across the cell must be multiplied to obtain the local current density at the various points along the cathode (Fig. 6).

Let us now go back to the chromium bath that was used in determining the second curve of C.P. as a function of T (Fig. 3). This bath is used in an automatic installation for plating parts whose shape is particularly difficult, as can be seen in Fig. 7 and 8.

At 35°C. and under 8 amp./dm.², the insides of these parts are completely chromium plated without their edges being dull or burnt. We may therefore consider that conditions 1 and 2 have been satisfied and use those values as our point of departure in applying the formula to calculate the associated temperature-current density values which will give the same plating result.

*See Appendix II.

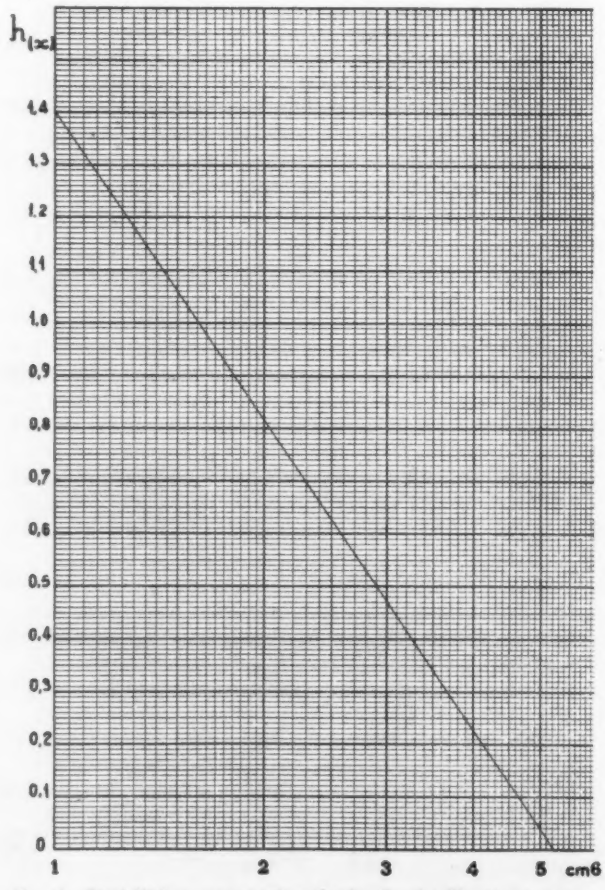


Fig. 6. Straight line representing the family of calibration curves.

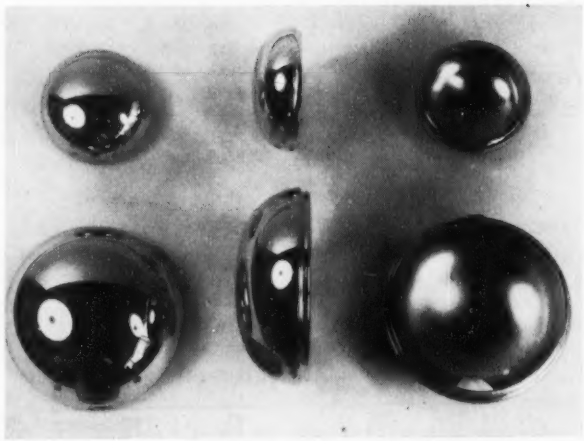


Fig. 7. Foglight shells, the insides of which are completely chromium plated with the bath of Fig. 3.
(Courtesy of Societe des Projecteurs Marchal)

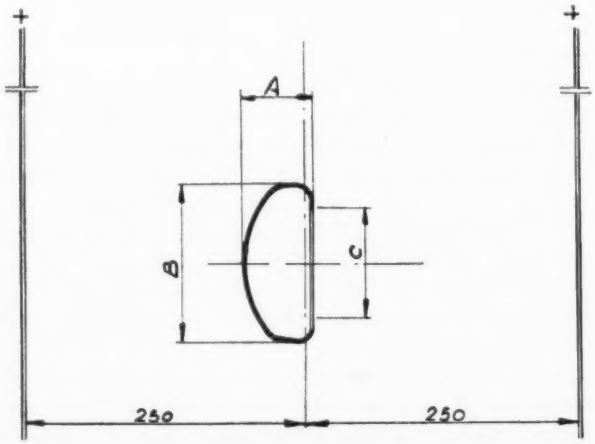


Fig. 8. Positioning and dimensions in centimeters of the parts shown in Fig. 7.

	A	B	C
Large Part	50	145	125
Small Part	38	90	74

At 35°C. and under 8 amp./dm.²,

$x_1 = 40$ mm. i.e. $h_{(x1)} = 0.22$

and $p_1 = 1.75$ amp./dm.²

At 38°C. and under 8 amp./dm.²,

$x_2 = 38$ mm.

and $p_2 = 2.1$ amp./dm.²

In order to cover x_1 at this latter temperature, we must plate at:

$$\frac{p_2}{h_{(x1)}} = \frac{2.1}{0.22} = 9.5 \text{ amp./dm.}^2$$

Similarly, at 40°C.,

$p_3 = 2.5$ amp./dm.²

so that the plating must be carried out at:

$$\frac{2.5}{0.22} = 11.5 \text{ amp./dm.}^2$$

in order to cover the same length, x_1, etc.

We thus obtain the following table:

Temperature (°C)	*Covering Power* (*amp./dm.²*)	*M.C.D. to cover an identical length* (*amp./dm.²*)
35	1.75	8
38	2.1	9.5
40	2.5	11.5
42	3.1	14
45	4.4	20
48	6.2	28

Conclusion

In conclusion, these associated values for temperature and M.C.D. which we have worked out above can serve as a general guide in selecting values for these objects plated are of a fairly difficult shape.

Generally speaking, it is always possible to:

1. Plot the curve of C.P. as a function of T for any particular bath, any particular basis metal and any cleaning sequence.
2. Test in the production tank the part to be plated by beginning with a fairly low temperature (35°C., for example) and finding the mean current density (M.C.D.) which gives optimum results (which ought to be somewhere around 8 amp/dm.²).
3. Calculate, on the basis of these initial values, a series of associated values for T and J, which will ensure identical plating results.

It will then be possible to make a selection that will satisfy the third condition, i.e., plating time, or speed of deposit.

It should be kept in mind, however, that, if there is no imperative factor governing this third condition, then it is preferable to adopt the solution corresponding to the lowest possible values for these two variables. The reason for this is the obvious economy (in heat. generators, evaporation loss, etc.), efficiency, and operating simplicity.

The author wishes to express his appreciation to *Professor Audubert*, Director of the Electrolysis Laboratory of the French National Center for Scientific Research, for his permission to publish this article.

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Appendix I

It appears that the optimum CrO_3/H_2SO_4 ratio (or the ratio of CrO_3 molarity to SO_4 normality), which has long been taken as equal to 100 (or 50), falls into the category of empirical trade rules and must henceforth be abandoned.

Pinner and Baker[4] had already shown qualitatively that the value of the optimum ratio varies with the CrO_3 concentration (increasing as CrO_3 decreases) and with the concentration of Cr_2O_3 and Fe.

Mohler,[5] using a cell with a central slot, also brought out this fact by making a comparison of two baths, one with a 400 g./l. concentration of CrO_3, and the other with a 250 g./l. concentration.

Finally, it has been possible to confirm these findings quantitatively[8] by plotting isochromes using the bent cathode method.

The main danger involved in this ratio is the misleading conclusions to which its *generalized use* frequently leads. We shall merely cite two examples.

Pinner and Baker, whose study has already been discussed in other respects,[8] use the ratio of molarity of CrO_3 to normality of SO_4 as the ordinates for their graphs. They draw the conclusion that Cr_2O_3 and Fe affect the optimum range by widening or narrowing it greatly. Transferring their results to a graph with the H_2SO_4 concentration as ordinate shows nothing more than a translation of that range.

Guthrie and Clifton,[6] presented a study of low concentration chromium baths which apart from their systematic use of the CrO_3/SO_4 ratio, is open to criticism:

1. The use of L-shaped cathodes placed somewhere in the middle of the cell.
2. A semi-quantitative evaluation, on those cathodes, of the covering power (wrongly called "throwing power").
3. The measurement of cathode efficiency on the L-shaped cathodes (this measured efficiency cannot, therefore, reasonably be related to any current density, not even a mean current density, owing to the variety of current densities over the cathode).
4. Graphs expressed in the form of cathode efficiency (measured as described above) as a function of the CrO_3/SO_4 ratio — which is particularly serious in the case of weak baths. Thus, in their Fig. 2, these authors use a bath containing 75 g./l. of CrO_3 and made up at a ratio $CrO_3/SO_4 = 100$. Normally, the optimum ratio at this concentration should be somewhere around 500 or 600.

There is no point in insisting further upon the necessity for abandoning this obsolete rule of thumb.

Appendix II

Strictly speaking, we should say that the ordinates of two given curves are in the same ratio as the total currents (or mean current densities). It appeared simpler, however, to speak of homothesis in ordinates.

Moreover, this homothesis is not rigorously accurate for a given electrolyte, especially an alkaline-type bath, unless the total currents (or MCDs) are of the same magnitude.

As a matter of fact, it is obvious that the local current density at a given point will not, for MCDs of, say 0.1 amp. and 10 amp. respectively, be in relation to those values, owing to the fact that polarization will be widely different between the two cases. On the other hand, if the MCDs are of the same magnitude (as is the case in this paper), then the polarization will also be similar. Furthermore, since the dimensional characteristics of the cell (the standard Hull cell and, even more so, the immersion-type Hull cell) are greater than the Wagner dimensional parameter,[7] current distributions will be homothetic.

Science for Electroplaters

16. Motors and Generators

By L. Serota

This is the second half of Part XVI of this series. The first half appeared in the July issue—Ed.

Motors

A motor is designed to change electrical energy into mechanical energy. A conducting wire carrying a current has a circular magnetic field around it. When such a conductor is placed in a uniform magnetic field, between poles, it will tend to move at right angles to the field. This can be shown by Fig. 65. A copper bar placed near the pole of a magnet marked N will not move, since the magnetic lines have no effect on copper. If, however, a current is sent through the wire attached to the copper bar, the bar will move sideways, the direction varying with the current. The strength of the magnetic field and the amount of current flowing through the wire will determine the force with which the wire will move. A single loop, carrying current, when placed in a magnetic field, will exert a force or torque with a push down upon the side of the loop through which the current is flowing in, marked A in Fig. 66 and up on

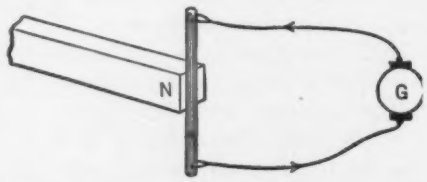


Figure 65. When a current is sent through the wire, it tends to move sideways.

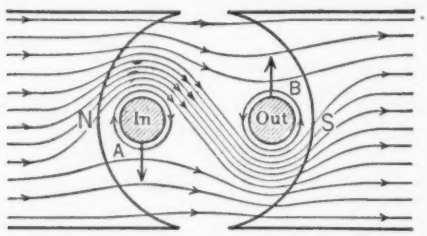


Figure 66. The distortion of the magnetic field produces a tendency to turn the coil.

the side of the loop marked B. A rotary (twisting) motion is thus developed. The amount of this torque in a motor is governed by the current and the length of the wire in the armature (coil) and the strength of the magnetic field. This is the principle of the direct current motor.

Since AC power is available in most plants today, the driving motor for all high-current low-voltage electroplating generators is either a squirrel cage induction motor or a synchronous motor.

Induction Motor

The essential parts of an induction motor are the stationary winding or stator, which sets up a rotating magnetic field, and the rotating part or rotor, which is built along the lines of a squirrel cage, Fig. 67. The stator is also called the primary, because it receives power from the line. The rotor is called the secondary. To obtain a rotating magnetic field, consider two alternating current lines (marked line 1 and line 2 in Fig. 68 of the same frequency, but differing in phase by 90°, connected to two sets of coils of the stator. The frequency (cycles per second) of the alternating current is determined by multiplying the number of revolutions per second of the rotating poles by the number of poles. The common frequency is 60 cycles per second; that is, the voltage (emf) and current in the circuit will reach a maximum, drop to zero and complete this cycle again (Fig. 55) 60 times in each second. In diagram I of Fig. 68, current in line 1 is indicated at its maximum (90°) while current in line 2 is at the zero stage. Hence the poles AA_1 are magnetized and become the N and S poles, with the magnetic flux shown by the dashes and an arrow, while the poles BB_1 are not magnetized. If now an eighth of a turn (45°) instead of a quarter turn is made, both sets of poles will be equally magnetized and the magnetic field will show the position presented in diagram II. Another 45° turn, and current in line 2 is at a maximum while that in line 1 has dropped to zero, and the N and S poles for the magnetic field are now in the direction of magnetized poles BB_1 with AA_1 being unmagnetized. Continuation of this operation will produce a revolving magnetic field which would cause a magnet to rotate (rotor), resulting in a two-phase AC motor. The squirrel-cage rotor consists of an iron core with large copper bars, resembling a squirrel cage, placed in slots just below the surface of the core and connected at the ends. Although the rotor has no electrical connections with the stator it acts like a loop, and the induced current from the stator magnetizes the iron core. The rotor current thus develops a torque with the rotating magnetic field, causing the rotor to turn (drag the rotor around).

The rotor speed in an induction motor is slightly less than the synchronous speed (speed at which rotating magnetic field revolves). This difference in speed for any load between that of the magnetic field and the rotor is called the slip. If no slip occurred, lines of force would not be cut, no emf would be induced, and no rotor cur-

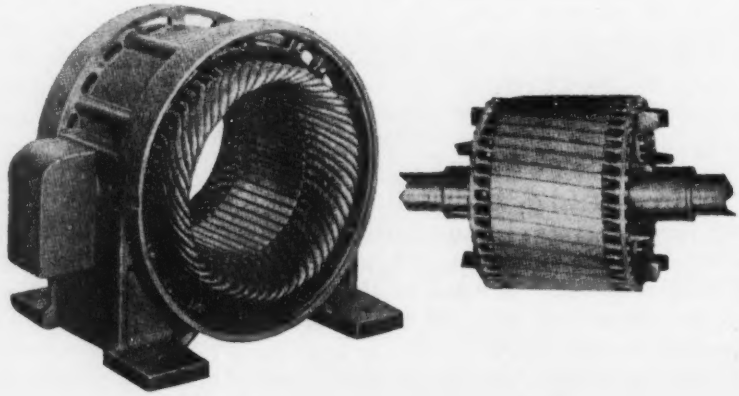


Figure 67. An induction motor: the stator (left) and rotor (right).

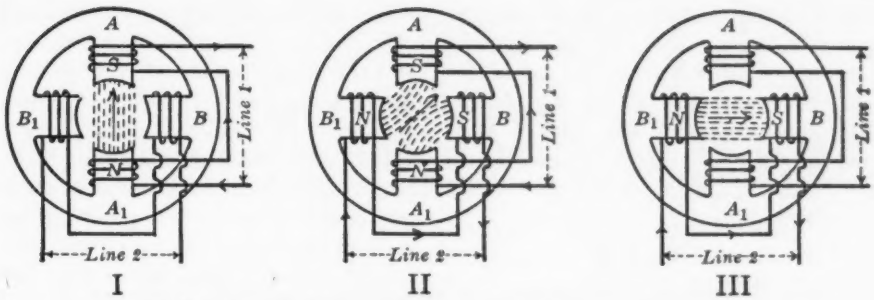


Figure 68. A rotating magnetic field produced by two currents 90° apart.

rent would flow; hence no torque would develop, so that power would not be available for driving the rotor against a load. Slip is usually expressed in terms of per cent of the synchronous speed. If, for example, a squirrel cage motor rated at 1800 revolutions per minute (rpm) has a full load speed at 1740 rpm, the per cent slip at full load would be

$$\frac{1800 - 1740}{1800} \times 100 = 3\tfrac{1}{3}\% \text{ slip.}$$

Synchronous Motor

The stator (stationary armature) windings for a synchronous motor, as with the induction motor, will produce a rotating magnetic field when excited by an alternating voltage. The rotor circuit, however, is not excited by an induced emf but by direct current from a small d-c generator which is called an exciter. Once started and brought up to synchronous speed, the attraction of the poles of the rotor by the poles of the rotating magnetic field will cause the rotor to revolve at synchronous speed. A synchronous motor revolves at the same speed as the alternator (ac generator) that supplies the current, or a proportionate rate. Most synchronous motors are brought up to speed now (about 95% of synchronous speed) by having the synchronous motor act as an induction motor. The rotating magnetic field acting on the damper windings in the face of the rotor poles produces a starting torque, causing the rotor to turn. The d-c field excitation applied at the right time brings the motor into synchronism by producing alternate north and south poles, which results in the poles of the rotor being attracted by the poles of the rotating magnetic field. The rotor is then said to be locked into position, thus enabling the rotor to revolve in step with the rotating magnetic field.

Synchronous motors have the advantage of running at constant speed. The speed is not affected by variations of load as is the case with induction motors, but will be determined by the frequency of the supply circuit (voltage) and the number of poles.

When the motor starts as an induction motor, it will run from 2 to 5% below synchronous speed. When excitation is applied, the amount of torque which the motor will exert in pulling into step is known as "pull-in" torque. If the load is too great, the increased torque requirement will cause the motor to pull out of step, stop and burn, unless, as in present motors, controls are used to protect the windings.

Changes in field current will not change the speed of the synchronous motor but will change the phase angle of the armature current and the applied voltage. When current is in phase with the voltage, then the motor is operating at unity power factor; that is, sufficient field excitation is supplied to meet the requirements of the motor only. The power at any instant in an alternating current circuit is equal to the product of the voltage times circuit. Any point on the power curve in Fig. 69 is thus equal to the product of the values of the voltage and current at that instant (current and voltage are in phase). The power curve is always positive because the product of e and i will be positive. Power factor in an alternating current circuit is defined as the ratio of actual power to apparent power, where the apparent power is taken to be the product of the effective values of voltage and current. With a weaker field strength, the power factor becomes less than unity and the motor is under-excited. The armature current then lags behind the voltage. With a stronger field strength the power factor remains less, but the current will lead the voltage (leading current) and is over-excited. Power factor is thus governed by the field excitation, a weak field yielding a lagging current, a strong field a leading current.

Many synchronous motors are designed to operate at unity power factor. It is sometimes desirable to operate at 80% leading power factor and draw current which leads the voltage rather than lags. This means greater excitation and higher line current, thereby requiring a motor approximately 20% larger than necessary for unity power factors.

The 1955 issue of the METAL FINISHING GUIDEBOOK lists the line current for unity (1.0) power factor synchronous motor at various horsepower and speeds for 440 volt supply. The horsepower rating of the driving motor of a motor-generator set from the generator current and voltage rating is derived by the following formula:

$$\text{H.P.} = \frac{\text{A} \times \text{V} \times 100}{746 \times \%\text{ overall efficiency}}$$

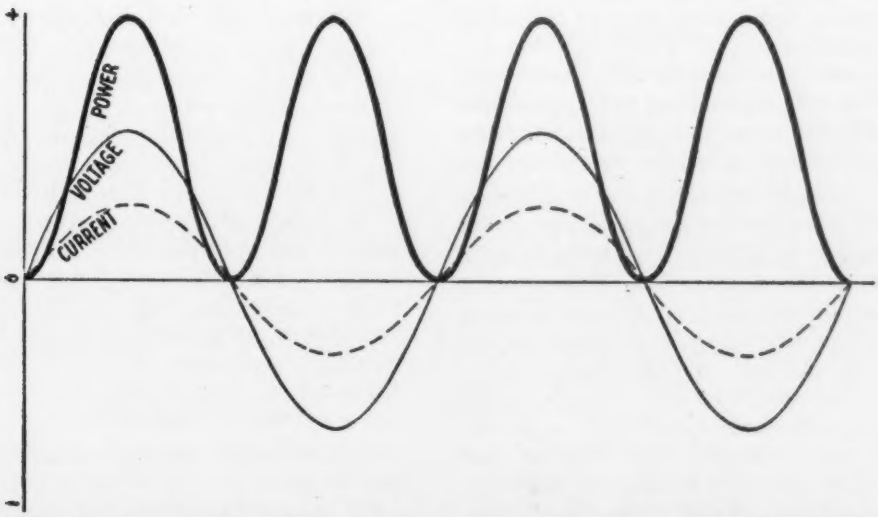


Figure 69. Current, voltage and power in a circuit operating at unity power-factor. Note that the current rises and falls with the voltage, and that the power is always positive. At every point, the product of current and voltage gives power.

An average overall efficiency of 80 per cent has been used for many years, for plating generator sets, in determining the motor H.P. rating. To obtain the horsepower, for example of a 6 volt 1000 ampere motor-generator set:

$$\text{H.P.} = \frac{1000 \times 6 \times 100}{746 \times 80} = \frac{600{,}000}{60{,}000 \text{ (approx.)}} = 10 \text{ H.P.}$$

Line current of a three phase synchronous motor is calculated from the following formula:

$$\text{motor input} = \frac{\text{motor output}}{\text{motor efficiency}}$$

$$\sqrt{3} \times V \times A \times \text{P.F.} = \frac{\text{H.P.} \times 746}{\text{motor eff.}}$$

$$\text{or } A = \frac{\text{H.P.} \times 746}{\text{eff.} \times \sqrt{3} \times V \times \text{P.F.}}$$

N.E.M.A. list the motor efficiency of synchronous motors at all H.P. and speeds. For the 10 H.P., 440 V, 1.0 P.F., 720 R.P.M. motor listed in this example, the efficiency is 87 per cent. By substitution,

$$A = \frac{10 \times 746}{.87 \times \sqrt{3} \times 440 \times 1} = 11.25,$$

or 11 amperes to the nearest ampere.

Sychronous motors are most generally used because they provide a source of energy which operates the plating generator at constant speed regardless of the load, thereby permitting a constant voltage at the plating tank. The direct-connected compound-wound exciter is therefore used. Synchronous motors also provide a very economical power factor correction, an important consideration in a plating shop because of the wide use of induction motors for polishing and buffing machines which operate a light load and relatively poor power factor.

A common practice now is to operate small or medium sized motor-generator sets in parallel for large tanks by splitting the anode rails. This provides greater flexibility for a lay-out than one with a single large motor-generator set. For example, the installation for a nickel tank that may require 20,000 amperes would include two 10,000-ampere, or possible three 6000 ampere units, instead of a single 20,000-ampere generator. If, at some later time, changes become necessary the smaller units may be used in a number of other places efficiently. Another trend is the elimination of control voltage on each plating tank by means of tank rheostats because of waste of power and poorer control and voltage regulation than that required in many cases. Instead, the tendency is to properly apply a small motor-generator set to each process, and to control the voltage in a very large number of fine steps with the generator shunt field rheostat. This provides smooth and accurate control over relatively wide voltage ranges and without appreciable loss of the efficiency of the motor-generator set.

A. E. S. CONVENTION

(*Continued from page* 52)

hoff with Laco Engineering and Sales, Inc., was presented with a suitably enscribed gavel. This presentation and the installation of officers were made by *Manson Glover* with the Glover Coating Co. and Chairman of the Law Committee.

Future Conventions

The schedule of future A.E.S. Conventions is as follows:

1957 — Montreal, Sheraton - Mount Royal Hotel. G. R. Davidson, general chairman, P. Coady, and Dr. J. Kane are in charge of the educational program. Mr. Davidson's address is 43 St. Andrews Road, Baie D' Urfé, P. Q., Canada.

1958 — Cincinnati, Sheraton-Gibson Hotel. This will be the first convention to break from the traditional June date and will be held during May.

1959 — Detroit, Headquarters hotel not yet constructed but will be connected with the exposition hall and will be under Hilton management. Construction is soon to start on the exposition hall, which will be the largest in the country, and located on the Detroit River at the foot of Woodward Avenue.

1960 — Los Angeles, Hotel Statler. The Los Angeles Branch bid for the convention was favorably voted on at the closing business session this year.

Acknowledgment

Grateful acknowledgment is made to *Dick Morrison* and *Gil Norton*, editors of the *Hanson-Van Winkle - Munning Official News*, for use of photographs in this article.

SHOP PROBLEMS

ABRASIVE METHODS SURFACE TREATMENTS CONTROL
ELECTROPLATING CLEANING PICKLING TESTING

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Basket Chromium Plating

Question: In your 1956 issue of the GUIDEBOOK you describe basket and barrel chromium. We would appreciate any information that you might give us regarding the solution composition for basket chromium plating.

G. A. F.

Answer: Fluosilicate baths are generally employed for basket and barrel plating because interruption of the current during agitation or rotation does not result in the usual "burnt" double plate, produced by the sulfate bath. A typical formula will contain:

chromic acid	250	g./l.
sulfuric acid	2	"
sodium fluosilicate	5	"

The above formula with the substitution of fluoboric acid for the fluosilicate has also been suggested for barrel plating. Proprietary solutions, which are self-regulating with respect to the catalyst content, are suitable for both basket and barrel plating.

Plating on Aluminum

Question: We were informed that METAL FINISHING has published several articles on the "Chromalum" process of plating on aluminum. Please furnish us with the correct references.

M. P. D.

Answer: The "Krome-Alume" process for plating on aluminum involved anodizing in oxalic acid solution, after which the oxide film was modified in sodium cyanide solution or hydrofluoric acid. Details will be found in U. S. Pat. 1,971,761 (1934) granted to W. J. Travers, and also in an article by Keskulla & Edwards in METAL FINISHING, **40,** pp. 220-4 (1942).

The process has been superseded by the "zincate" process, details concerning which will be found in any recent edition of the METAL FINISHING GUIDEBOOK.

Passivating Stainless Steel

Question: Can you give me any information on the passivating process of stainless steel? I know that it is an immersion process for brightening and deburring, but what is its composition, maintenance, and method of use?

C. R.

Answer: The solution employed for passivating stainless steel is 20% by volume nitric acid at about 120 deg. F. For the straight chromium steels, 2 oz./gal. sodium or potassium dichromate are added.

This solution will not deburr the metal. However, electropolishing processes will remove small burrs and, at the same time, passivate the surface so that a separate passivation treatment will not be needed.

Cleaning Rack Tips

Question: Could you tell me what methods are used in the U. S. A. to remove nickel and chrome build-up on contact points of plating jigs?

H. H. W.

Answer: In many plants, racks are routed through a reverse current strip after each plating cycle, in order to remove chromium and nickel deposits. In others, when the deposit has built up fairly heavy, it is removed by hammering the tips.

The first method is more desirable, especially when reverse current cleaning is employed since it eliminates contamination of the cleaner with dissolved chromium.

Tarnish Under Lacquer

Question: In our shop we plate polished zinc die castings with a copper, nickel, and flash brass cycle. Copper 0.0005", nickel 0.0005" thick and two minutes of brass. The work is very well rinsed and there are no spit-outs, but, in 3 to 4 months, the brass color looks very poor under the lacquer. We use both hot and cold lacquer and the same thing occurs. Is the brass fusing with the nickel? I assume the brass is 0.00001" thick.

I. T.

Answer: The brass deposit will not diffuse into the nickel undercoat. The discoloration of the brass after a few months may be due to insufficient thickness of lacquer which permits the atmosphere to penetrate. It may also be due to poor rinsing and drying.

Spot Plating

Question: We make many yellow gold rings today with white trim, and it is necessary to rhodium plate the white gold trim for brilliance. Our present method consists of painting the yellow gold with a stop-off lacquer, then dissolving this resist with acetone after the plating cycle.

This method is not only very time-consuming, but has many drawbacks on rings with fine filigree or recesses which are difficult to get at for painting in the lacquer and repolishing the area. We wonder if there is not an easier method of spot plating that we could use, and would appreciate any information you may have on this subject.

M. H. F.

Answer: The rhodium might be applied by brush or spot plating. However, this would be just as time-consuming as stopping off with lacquer, and stopping-off might still be required to avoid deposition of rhodium over onto the yellow gold surface because of the small areas involved.

Sulfide Coating Iron

Question: Since you publish the lat-

est information in metal finishing, I would appreciate your advising me in regard to the procedure for depositing sulphur on steel pieces. This electrolytic coating on steel facilitates the use of pieces, with an economy of tools and time.

The method is known in the Argentine as "Sulfinization" but is in reality a copy of a French patent. A client has asked me to install equipment for sulphurizing matrices, but I don't even know the composition of the electrolyte, nor how it works (voltage, ampere density, temperature, etc.).

I would appreciate any help that you can give me.

H. B.

Answer: A process called "Sulfinuz" was recently by Imperial Chemical Industries, Ltd., London, S.W.1, England. This is a molten salt bath process for producing a sulfur case on iron alloys.

Barrel Gold Plating

Question: We work brass articles, barrel polished, and then, after adequate cleansing, we gold plate them directly, or nickel plate them, when white articles are necessary. The great part of our articles are buckles for our watch straps. The nickel plated buckles are quite good but the gold plated ones turn dark in a couple of weeks of use. We intended to gold plate the nickel plated ones, but in our plating barrel the gold fell off in less than a minute after the gold plating.

Our procedure is the following: after barrel polishing with balls in a submerged wooden barrel the buckles are cleaned cathodically, in an electrolytic cleaner. From there the pieces go either to the gold or nickel bath, as recommended in your 1955 GUIDEBOOK for barrel plating (the low gold solution of page 269 and the barrel plating nickel solution of page 300-1).

Even with a thorough rinse before and after plating, the gold plated buckles tarnish relatively quickly. When trying to gold plate the nickeled buckles, we activated the surface with a 50% muriatic acid solution, rinse, and dip in a 10% sodium cyanide solution. Even then the results were not as good as required, although much better than those obtained when directly gold plating on brass.

I. T.

Answer: Although gold does not tarnish, a thin deposit is so porous that the brass will tarnish right through it. It is for this reason that a nickel undercoat is employed unless the article is protected with a lacquer coating. After nickel plating, the buckles should be rinsed and immediately gold plated. A time lag will promote passivity of the nickel and interfere with the gold plating process. No activation treatment should be necessary.

If peeling of the gold deposit is still experienced, the under side of the gold flakes should be examined since, if white, it would indicate that it is not the gold which is peeling but that the nickel deposit is laminated, a common trouble when small parts are barrel plated, using brightener such as cadmium.

Imitation Rhodium Finish

Question: Can you furnish us with a good formula for white tin or imitation rhodium?

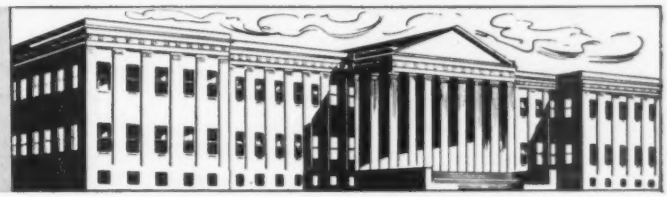
A. M.

Answer: A white tin flash, to be used as an imitation rhodium finish, can be prepared by dissolving 4 oz. of sodium stannate and 2 oz. of caustic soda in one gallon of water. The solution is used at 6 volts and about 175 deg. F.

Proprietary solutions for the purpose are available from a number of suppliers. Most of these are white brass processes which appear to be easier to control. A list of suppliers is enclosed.

Patents

RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD



Gas Plating

U. S. Patent 2,731,361. *Jan.* 17, 1956. *H. R. Nack and J. R. Whitacre, assignors to The Commonwealth Engineering Co. of Ohio.*

A process of gas plating a metal body with nickel from nickel carbonyl, said process comprising introducing said metal body to be gas plated in an enclosure along with nickel metal, heating said metal body to a temperature between about 500 and 800°F. and below the softening point of the metal, heating said nickel metal to a temperature between about 1,200-1,525°F., passing a stream of carbon monoxide over said nickel metal and metal body while thus heated, and subsequently decreasing the temperature of said nickel metal and said metal body, and thereafter contacting the metal body at said decreased temperature with carbon monoxide mixed with nickel carbonyl to cause decomposition of said nickel carbonyl and deposition of nickel onto the surface of said metal body.

Hot Dip Aluminum

U. S. Patent 2,731,362. *Jan.* 17, 1956. *K. J. Brondyke, assignor to Aluminum Co. of America.*

The method of coating a ferrous metal body with aluminous metal by the dip coating process wherein the aluminous metal is directly bonded to the ferrous metal body comprising covering the surface of said ferrous metal body with a dry solid chloride-free flux, said flux containing as its essential components from 65 to 85% by weight of at least one alkali metal bromide and from 15 to 35% of at least one fluoride of the group consisting of potassium fluoride and potassium acid fluoride, immersing said flux covered body in a bath of molten aluminous metal and thereafter withdrawing the body from the molten bath.

Vacuum Metallizing

U. S. Patent 2,371,366. *Jan.* 17, 1956. *A. R. Weinrich, assignor to Libbey-Owens-Ford Glass Co.*

The method of providing a smooth uniform coating of aluminum on a surface, which consists in providing a filament selected from the group consisting of tungsten, molybdenum, tantalum and columbium, placing on said filament an aluminum alloy containing between 0.25% and 10% tungsten and the balance substantially aluminum, said tungsten coacting with said aluminum and said filament to retard the speed at which the aluminum spreads out upon the filament when heated preliminarily to being evaporated, and heating said aluminum alloy to evaporate the aluminum component thereof from said filament onto a surface to be coated.

Manufacture of Nickel-Plated Steel

U. S. Patent 2,731,403. *Jan.* 17, 1956. *M. M. Rubin, assignor to Pittsburgh Steel Co.*

The method of making a coated steel product from hardenable steel selected from the group consisting of plain carbon steels containing from .26% to 1.50% carbon and alloy steels which are hardenable by being heated to a temperature within the range of from about 1,450°F. to about 1,650° F., said method comprising electrodepositing a coating of nickel on said steel, subjecting the coated steel to a treatment in which the steel is hardened by being heated to a temperature within the range of from about 1,450° F. to about 1,650°F. and cooled, and then tempered, said treatment resulting in the formation of an intimate bonding of the nickel coating with the steel, which is then substantially free from embrittlement, a hardening of the steel, and the development of desired physical properties in the steel.

Vacuum Metallizing

U. S. Patent 2,731,365. *Jan.* 17, 1956. *A. R. Weinrich, assignor to Libbey-Owens-Ford Glass Co.*

The method of providing a smooth, uniform coating of aluminum on a surface, which consists in providing a filament selected from the group consisting of tungsten, molybdenum, tantalum and columbium, placing on said filament an aluminum alloy containing between 0.5% and 10.0% molybdenum and the balance substantially aluminum, said molybdenum coacting with said filament and said aluminum to retard the speed at which the aluminum spreads out on the filament when heated preliminarily to being evaporated, and heating said aluminum alloy to evaporate the aluminum component thereof from said filament onto a surface to be coated.

Electroplated Airfoil

U. S. Patent 2,732,020. *Jan.* 24, 1956. *E. L. Scholl, assignor to U. S. Rubber Co.*

A substantially rigid aeroplane propeller blade having a slight degree of flexibility along its longitudinal medial plane, said blade including an inner, preformed, relatively rigid core of metal functioning to give configuration and strength to the blade, an intermediate layer of a rubber-like cushioning material enclosing the core and an outer skin of metal electrodeposit enclosing the layer of cushioning material, presenting a continuous unbroken surface to the air-beating portions of the blade and defining the leading edge, the trailing edge and the tip of the blade and between the leading and trailing edges forming the upper and lower camber portions of the blade, said outer metal skin being of relatively thin cross section of material in its camber-forming portion to provide for flexibility and thus to provide for a hinge effect along the medial plane of the blade, and said metal skin in

the parts forming the leading and trailing edges having a cross section of material greater than the portions which forms the camber portions, thus providing more rigidity in the edges than in the camber portions, thereby to provide a relatively thin and more flexible cross section of material in that portion of the skin which forms the camber portions of the blade than in the edge forming portions.

Hot Dip Coatings

U. S. Patent 2,732,321. *Jan.* 24, 1956. *C. B. Gill, A. W. Schlechten and M. E. Straumanis.*

A process for plating of metal onto a surface which can be heated to a temperature of at least 700°C. without destruction which comprises immersing the surface to be plated in a fused bath of inorganic, normally solid material of the group consisting of inorganic salts and inorganic bases which does not decompose when heated to temperatures between about 700° and 1,000°C., introducing a plating material from the group consisting of titanium metal, zirconium metal, hafnium metal, uranium metal, alloys thereof and compounds thereof which pyrolytically decompose into said metals at a temperature not greater than the temperature of operation defined herein into said bath, bringing said plating material in the bath into close proximity to said surface, and maintaining said bath at a temperature between about 700° and 1,000°C. until an appreciable coating of said metal is formed upon said surface.

Nitrogen-Containing Tarnish Inhibitors in Detergent Compositions

U. S. Patent 2,731,420. *Jan.* 17, 1956. *H. S. Sylvester, assignor to Colgate-Palmolive Co.*

A detergent composition tending in normal use to cause tarnishing of a copper base alloy in water solution consisting essentially of a water-soluble polyphosphate salt selected from the group consisting of tripolyphosphates and pyrophosphates, and having present therein a minor amount of a nitrogen-containing compound selected from the group consisting of ammonium hydroxide, diammonium phosphate, ammonium nitrate, ammonium sulphate, ethylene diamine, hydroxyethyl ethylene diamine, diethylene triamine, triethylene tetramine, taurine, methyl taurine, glycine, monoethanolamine, and 2-aminoethylsulphuric acid sufficient to inhibit said tarnishing.

Bright Copper

U. S. Patent 2,732,336. *Jan.* 24, 1956. *B. D. Ostrow, assignor to Elechem Corp.*

An electrolytic bath comprising an aqueous alkaline solution of a cyanide of copper, a soluble selenium compound taken from the class consisting of selenides, selenoureas, selenocyanates, selenites, selenates, and compounds of the formula RSeH wherein R is an organic radical taken from the class consisting of alkyl radicals of 1 to 6 carbon atoms and aryl radicals of 6 to 12 carbon atoms said selenium compound being present in an amount from .0001 to 5 grams per liter, together with a soluble compound of a metal taken from the class consisting of lead, and antimony in which the metal is present in an amount from .001 to 5 grams per liter.

Fused Bath Cleaning

U. S. Patent 2,732,339. *Jan.* 24, 1956. *H. G. Webster and R. W. Thomas, assignors to J. H. Shoemaker.*

An electrolytic fused salt cleaning bath for cleaning a metal work piece suspended in the liquid of said bath by passing electric current therethrough while maintaining the work piece for at least about one half of the electrolytic treatment period as a cathode, comprising an open top container forming a cell, two bus bars mounted substantially parallel along opposite upper edges of said container, a pair of V-shaped metallic stirrup members disposed a substantial distance from each other having each of their arms removably but firmly fastened to an opposite bus bar in current conductive support with the crotches of the said V members depending a substantial distance downward into the container as supporting members for objects positionable below the upper surface level of bath liquid in said container, a basket of foraminous metal comprising a work holder within which the work pieces may be disposed, said basket having a pair of horizontal supporting lugs each laterally extending from an opposite end thereof, each positioned to be engaged within a depending crotch of one of the V-shaped stirrups for gravitational support and temporary electroconductive contact therewith, whereby the foraminous basket is supported through said lugs between the pair of V-shaped stirrups gravitationally without further fastening while being disposed completely immersed within the liquid of said bath.

Centrifugal Blasting Apparatus

U. S. Patent 2,732,666. *Jan.* 31, 1956. *G. W. Powell, assignor to Pangborn Corp.*

In a centrifugal throwing wheel assembly for projecting blastant particles, a throwing wheel, a rotatable shaft carrying said wheel at one end for rotation to tangentially project particles fed to the central portion of the wheel, a generally flat base, said shaft being mounted for rotation on said base, said base having an opening into which part of the wheel is fitted, and a housing mounted on said base and encircling the portions of the wheel that extend beyond said base, said shaft having an enlarged flange, and the wheel having a diameter larger than that of the flange and being secured to said flange, the housing having a shaft-admitting opening with a diameter large enough for the penetration of the flange, and a wear plate secured to the inner wall of the housing and partially covering said opening to define a second opening smaller than the flange but sufficient for the penetration of the balance of the shaft.

Dust Collector

U. S. Patent 2,732,912. *Jan.* 31, 1956. *F. W. Young.*

A continuous rotary dust collector which comprises, in combination, a container providing a filtration chamber having an inlet for the gaseous mixture to be filtered, a generally cylindrical hollow gas permeable filter base structure mounted in said chamber for rotation about its principal axis, a filter cloth surrounding and carried by said structure, a source of suction, a conduit connecting said source to the interior of said structure, stationary baffles mounted within said structure extending into engagement with the inner surface thereof and defining a discharge sub-chamber isolated from said suction adjacent a narrow discharge area of said cloth, and a source of rapidly pulsating gas under very low pressure in communication with said sub-chamber for rapidly vibrating said cloth in said discharge

area thereby to discharge therefrom into said filtration chamber any particles deposited on the outer surface thereof.

Bright Acid Copper Bath

U. S. Patent 2,733,198. *Jan.* 31, 1956. *F. I. Nobel and B. D. Ostrow, assignors to Elechem Corp.*

In an acid copper plating bath containing a salt of copper and a free acid as the essential constituents, the improvement which includes the addition to said bath of the resinous reaction product obtained by the heating together up to about 200°F. of a substance taken from the class consisting of amino-thiazole and amino-thiazoline with a substance taken from the class consisting of alkyl aldehydes, aryl dialdehydes and alkyl dialdehydes wherein the alkyl groups have from 1 to 10 carbon atoms, the amount of said addition being sufficient to impart brightness and ductility to deposits of copper from said bath.

Chromate Films

U. S. Patent 2,733,199. *Jan.* 31, 1956. *R. M. Wick, assignor to Bethlehem Steel Co.*

The process of forming a non-metallic coating on the surface of a metal article which comprises electrolyzing a metal article having a surface material of corrodible base metal in an aqueous solution consisting essentially of chromic acid (100 to 400 grams per liter), a compound of the class consisting of boric acid and salts of boric acid, said compound being present in an amount of from 8 grams per liter to saturation, and chromium chromate in which the trivalent chromium is present in an amount between 2 per cent and 18 per cent of the total chromium in solution, said metal article acting as the cathode.

Chromium Bath Purification

U. S. Patent 2,733,204. *Jan.* 31, 1956. *R. L. Costa, assignor to Allied Chemical & Dye Corp.*

A process for reclaiming aqueous solutions of hexavalent chromium contaminated with metal cations, comprising bringing said solutions into reacting contact with a cation exchange resin consisting of a sulfonated infusible polymerizate of a polyvinyl aryl compound at a pH of less than 4 but not below 0 to displace the hydrogen of the resin with the metal cations, and separating the hexavalent chromium solution from said resin in which are held the contaminant metal cations, thus reclaiming purified hexavalent chromium solutions.

Cleaning Compositions Containing Tarnish Inhibitors

U. S. Patent 2,733,215. *Jan.* 31, 1956. *E. E. Ruff, assignor to Lever Brothers Co.*

A cleaning composition comprising a water-soluble polyphosphate which in aqueous solution tarnishes copper and copper and nickel alloys and a tarnish inhibitor in an amount to lessen the tarnishing action of the polyphosphate and having the general formula:

$$[R—\underset{\underset{O}{\|}}{C}—NHO]_nM$$

where M is selected from the group consisting of hydrogen and a metal, R is an aliphatic hydrocarbon radical having from seven to seventeen carbon atoms, and *n* is the valence of M.

Abrasive Blasting Machine

U. S. Patent 2,733,550. Feb. 7, 1956. *A. V. Hollingsworth.*

A polishing and deburring apparatus comprising an open-sided drum rotable about a horizontal axis, abrasive conveying means adjacent the periphery of said drum for dropping abrasive material through a well defined free-falling path, and a horizontal table mounted adjacent to and extending partially within and partially without the open side of said drum for rotation into and out of the path of free-falling abrasive materials falling from said conveying means.

Measurement of Surface Finish

U. S. Patent 2,733,598. *Feb.* 7, 1956. *P. T. Miner, assignor to Kota-Meters, Inc.*

A system for sensing variations in surface finish which comprises a tracer point positionable with its axis perpendicular to a test surface, supporting means rotatable about a first axis, means carried by said supporting means for coupling said tracer point to said supporting means and rotatable thereon about a second axis, means on said supporting means for maintaining substantially constant the pressure between said tracer point and said surface, means for bodily moving said supporting means over said surface in a direction perpendicular to said second axis to develop a frictional force on said tracer point proportional to the roughness of said surface thereby to tend to rotate said tracer point about said second axis, and electro-mechanical transducer means coupled to said tracer point to oppose and sense the rotational forces on said tracer point relative to said second axis for producing an output indication proportional to the roughness of said surface.

Pickling Process

U. S. Patent 2,733,999. *Feb.* 7, 1956. *C. J. Rodman, assignor to Alliance Ware, Inc.*

The process of pickling iron objects supported on a conveyor of highly acid-resistant metal electropositive to the iron and composed essentially of copper and nickel, which comprises continually moving the objects while supported upon the conveyor through a series of sprays each of which continuously sprays the conveyor and the entire surface of each of the objects in succession as it is moved through the spray, said sprays including (1) a spray which removes oil and grease from the objects, (2) pickling spray of dilute acid heated to a temperature at which the conveyor is attacked, but only slightly, to produce a solution of low concentration of electropositive metal in the liquid resulting from the spraying operation, using said liquid for spraying additional objects whereby metal dissolved from the conveyor is deposited on the objects, and (3) spray to remove the acid, each of said sprays being heated whereby the objects after final spraying are heated sufficiently to dry substantially more rapidly than if unheated, and moving the conveyor at such a rate that only a very thin deposit of the metal is formed on the objects.

Lead-Tin Alloy Plating

U. S. Patent 2,734,025. *Feb.* 7, 1956. *E. J. Roehl, assignor to Pittsburgh Steel Co.*

An electrolyte for the electrodeposition of lead-tin alloys comprising an aqueous solution of lead fluoborate, tin fluoborate, fluoboric acid and approximately one to two grams of addition agent per liter of electrolyte, said addition agent consisting of a condensation product of ethylene oxide with a material from the group consisting of beta-naphthol and diphenyl ether.

Titanium Coating

U. S. Patent 2,734,003. *Feb.* 7, 1956. *M. B. Alpert, assignor to National Lead Co.*

A method for coating the surface of a base metal which lies below titanium in the Electrochemical Series which comprises placing the base metal in a bath containing reduced titanium halide selected from the group consisting of titanium dihalide and titanium trihalide and a fused salt selected from the group consisting of alkali metal halide and alkaline earth metal halide at a temperature of at least about 800° C. to below the temperature at which the physical properties of the base metal are adversely affected and the fused salt volatilizes, maintaining a high molality of reduced halides in said bath and maintaining a high ratio of titanium dihalide to titanium trihalide during said process until said base metal is coated with titanium metal.

Copper-Zinc Alloy Bath

U. S. Patent 2,734,026. *Feb.* 7, 1956. *A. E. Chester, assignor to Poor & Co.*

A plating bath comprising an alkaline zinc copper cyanide bath containing in solution a quantity of the product of the reaction of a cyclic oxy-aldehyde and a water soluble aliphatic amine containing amino groups from the group consisting of primary and secondary amino groups, said amine further containing a water solubilizing radical from the group consisting of hydroxy, carboxy and sulfonic radicals and salts thereof, said reaction product being soluble in alkaline aqueous solutions having a pH of about 12 and characterized by the fact that said product does not form deep blue complex copper ions in cyanide solutions containing sodium cuprous cyanide, said quantity being sufficient to enhance the brightness of the zinc-copper plate electrodeposited from said bath.

Reciprocating and Rotating Blade Polisher

U. S. Patent 2,734,316. *Feb.* 14, 1956. *E. W. Dawson, assignor to A. V. Roe Canada Ltd.*

A polishing device for small parts comprising a base, a sleeve resiliently mounted on the base, a shaft journalled in the sleeve for rotation relative thereto but fixed against axial movement relative to the sleeve, a part holder fixed to one end of the shaft, a can adapted to contain a polishing compound surrounding the part holder and fixed to the shaft, means to rotate the shaft and means to reciprocate the sleeve.

Pickling Titanium

U. S. Patent 2,734,837. *Feb.* 14, 1956. *S. Hands, assignor to Imperial Chemical Industries, Ltd.*

Method of surface treatment of titanium or titanium base alloy articles prior to deposition of a coating metal thereon, which comprises treating the surface of the said articles with concentrated hydrochloric acid solution at a temperature between 90°C. and the boiling point of said solution.

Wire Plating Machine

U. S. Patent 2,734,858. *Feb.* 14, 1956. *R. J. Bachman, C. E. Lewis, P. L. Mueller and G. E. Murray, assignors to Western Electric Co., Inc.*

In electroplating apparatus wherein a filamentary conductive core is advanced continuously through an electroplating cell to produce a composite electroplated conductor, the improved electroplating control apparatus which comprises a source of E. M. F. having a variable voltage output for supplying plating current to the electroplating cell, resistance monitoring means for detecting variations from a predetermined magnitude in the resistances of successive increments of the finished composite electroplated conductor of a predetermined length, primary means responsive to said resistance monitoring means whenever such a resistance variation is detected for demanding a new value of plating current such as would tend to restore the resistance of the finished conductor to the predetermined magnitude and for changing the output voltage of said source by an amount substantially proportional to the demanded change in the plating current, and secondary means responsive to the primary means and the plating current for continuously comparing the instantaneous plating current supplied to the cell with the value of plating current demanded by the primary means and for changing the output voltage of the source by an amount substantially proportional to a detected variation therebetween so as to maintain the actual plating current substantially constant at whatever magnitude is demanded by the primary means.

Plating Rack

U. S. Patent 2,734,859. *Feb.* 14, 1956. *A. F. Reilly and J. R. Stoklas, Jr., assignors to Keco Plating Co.*

A rack for suspending articles to be electroplated in an electroplating bath comprising a current conducting rack bar adapted to be immersed in said bath and to make contact with an electric circuit external of the bath, the portion of said bar immersed in said bath being covered with a layer of corrosion resistant insulation, and means for supporting the articles to be plated at selected positions longitudinally on said bar, said means comprising a holder member surrounding said bar, a pair of independent detachable article supporting current conducting insulated arms disposed adjacent to and on opposite sides of said bar and within said holder member and each extending divergently outwardly from and transversely of said bar, the outer extremities of said arms being uninsulated for supporting and making electrical contact with the articles to be plated, each arm having a pointed contact pin connected thereto and projecting inwardly toward said bar from the part of each arm that lies adjacent said bar, screw means threaded into said holder and bearing against one of said arms opposite said pins, said screw means being adjustably threadable in said holder whereby to apply pressure against said arms to cause each contact pin to penetrate insulation on said bar and make electrical contact with said bar.

Scale Removal

U. S. Patent 2,735,818. *Feb.* 21, 1956. *P. H. Cardwell and L. H. Eilers, assignors to The Dow Chemical Co.*

A composition for descaling a surface comprising by weight in admixture from 0.2 to 0.8 per cent of an alkali metal silicate, from 0.3 to 25 per cent of a gelling agent selected from the group consisting of pectin, gum karaya, methyl cellulose, Irish moss, psyllium seed, gum ghatti, gum pershir, gum shiraz, from 6 to 30 per cent of a fragmented fibrous material selected from the group consisting of ground leather, sponge, wood, paper, cotton, bark, nut shells, peat, corn cob, the balance being aqueous hydrochloric acid containing from 5 to 30 per cent of HCl.

ABSTRACTS

Hard Chrome Plating of Aluminum

C. Etienne: *Revue de l'Aluminium.* Vol. 31, No. 209, pp. 139-143.

Hard chromium plating of aluminum imparts to the base metal a high wear-resistance characteristic, a great hardness and a good resistance to alkaline solutions. The coating thickness of the plate is usually 25 to 150 microns and has a hardness of 70 to 75 Rockwell. Chromium coatings of this type are obtained in a different manner from those produced for decorative plating, which are only 0.5 micron thick. The significance of hard chromium plating of aluminum becomes obvious if one considers the characteristics of the base metal—the considerable softness of the metal i.e. its great ease of working and shaping, its good thermal conductivity, ease of machining and profiling and ease of processing, i.e. ease of casting in molds or as die castings under pressure as well as the important consideration for many applications, particularly in the electrical industry, that it is nonmagnetic.

Of great importance for many applications, such as for the construction of chemical plant, is the resistance of the chromium plated aluminum to alkalies and organic acids, which property has not yet been utilized in full. In conclusion, the author discusses various applications, for which hard chromium plated aluminum is at present being used.

Large Hard Chromium Plating Units for Ships Diesel Engine Cylinders and Pistons

Metalloberflaeche. Vol. 9, No. 6, p. 95 B (June 1955).

Details are given of the large new hard chromium plating unit installed at the German concern of Gebr. Schoch Hartchrom G.m.b.H., Germany. The internal chromium plating of the running surfaces of engine sleeves, fitted between the cylinder and piston, is assuming ever growing importance. For this application, the hard coating is of particular advantage by virtue of its resistance to wear and to high temperatures as well as providing a protective action against the corrosive influences of the combustion products of the engine fuels. The disadvantage of the deposit, that it wets badly with the lubricating oil, has been overcome after many years experience, by controlling the characteristic network structure of the plate so that an increase of the fine cracks and channels, which are formed during the growth of the plated coating, is induced. This has the effect that the lubricating oil tends to be drawn into the chromium coating and distributed evenly over the surface. It is stated that the coating prepared in this manner is better able to withstand severe stressing than by other means.

For the hard chromium plating of ships diesel cylinders, an installation has been erected which is claimed to be the largest unit of its type in Europe. The diesel engine cylinders are plated to over-dimension and are subsequently fine-ground down to a finish dimension of 0.4 mm. coating thickness (about 0.016"). For the mechanical processing of the plate, it was necessary to install an outsize honing machine.

Removal of Carbonates from Cyanide Baths with Ion Exchangers

H. Guenther: *Fertigungstechnik.* Vol. 4, No. 9, pp. 402-406.

A problem with the operation of cyanide plating baths is the build-up of carbonate with the course of time. Although a certain carbonate concentration is desirable for normal plating from cyanide baths, with a carbonate concentration of 100 and more g./l. these baths do not work satisfactorily. Carbonate removal from cyanide baths, although practiced up to now, has had serious shortcomings and a better removal method to lower the concentration has been desired. In particular, the line of least resistance which is often practiced, to halve the bath volume and make up with fresh cyanide and metal salt, rejecting to waste the other half, is wasteful in the extreme.

Removal of the carbonates with the aid of ion exchange substances allows a cyanide bath to be maintained in good operating condition over a much longer period of time and metal salt and cyanide losses are avoided. The method employed is very simple of operation and is based on the fact that sodium ions are exchanged for hydrogen ions. The carbonate ions which are set free then combine with the hydrogen ions and the free carbonic acid decomposes into water and CO_2 which leaves the bath as gas. Only the sodium ions of the carbonate molecule are affected while the sodium ions of the sodium cyanide remain unaffected. The ion exchange substance used can be regenerated by fresh loading with hydrogen ions when it is exhausted and can then be used for further service. The regeneration is conducted by treatment of the exchanger with a 10% hydrochloric acid solution. Careful rinsing is necessary after the regeneration so that no acid residues are left before placing in the cyanide bath. The ion exchanger material has been used more than 12-15 times without any reduction in effectiveness being discerned.

Mechanism of the Electrolytic Deposition Processes of Chromium

A. I. Lewin and co-workers: *Doklady Akademii nauk U.S.S.R.* (Transactions of U.S.S.R. Scientific Academy. Vol. 154, No. 1, (New series), pp. 105-180.

On the basis of comprehensive detailed current density measurements in the electrolysis of CrO_3 solutions with electrodes of various metals, the author subjects the theories of Mueller and Liebreich to a fundamental criticism. According to the results obtained with this work there is a large drop in current density in the region of zero potential of the electrode metal. The direct reduction of the $CrO_4=$ ions at the cathode to metallic chromium can be regarded as proved. In addition, there occurs according to polarographic investigations, $Cr(OH)_3$, $Cr(OH)_2$ and Cr in the cathode chamber. Apparently the diaphragm-like covering coating which was postulated by Mueller can be ascribed to the appearance of difficultly soluble $Cr(OH)_3$.

Regeneration of Electrolytes for Electropolishing of Carbon Steel

T. Zak and J. Socha: *Prace Instytutow Mechaniki (Poland).* Vol. 4, No. 12, pp. 11-19.

The authors describe in this report a process for the anodic oxidation of chromium in 12.5% sulfuric acid and in mixtures of 12.5% sulfuric acid

with 65% orthophosphoric acid. It was stated that the orthophosphoric acid restricts the anodic oxidation of chromium. The authors give details of their investigational experiences and the optimum conditions for the chromium regeneration in electropolishing baths for the electropolishing of carbon steel. Anodic current density = 9 amp./sq. dm.; cathodic current density = 200 amp./sq. dm.; bath temperature = 100°C.

Formation of Porosity with Electroplated Coatings

L. S. Sapiro: *Shurnal fisitscheko chimii* (Journal Physical Chemistry—Russia). Vol. 28, No. 1, pp. 26-29.

The porosity of electroplated coatings has its cause in the formation of gas bubbles at the cathode surface. From the thermo-dynamics of heterogeneous phases, the critical dimensions for the formation work of the bubbles was calculated. The smaller this work is, then the more readily does bubble formation occur and accordingly strong gassing.

In conclusion it was stated that a temperature increase serves to further the gas formation and reduces the formation work, however, the adhesion angle is smaller and consequently the porosity is reduced.

Hard Chromium Plating of Cutting Tools

M. I. Andrianow: *Stank i Instrument* (Machine Tools and Tooling—Russia). Vol. 25, No. 2, pp. 21-23.

Details are given in this report on trouble-free hard chromium plating of cutting tools, by which a considerable increase of the tool life can be achieved. It is necessary, however, with the tool in use on the machine, to provide sufficient cooling for the plated cutting tools as, at temperatures above 450-500°C., the most favorable characteristics of the chromium coating disappear.

Comprehensive details are given of the most suitable arrangements and working conditions for the chromium plating of boring tools by which the thickness and distribution of the coating can be controlled by influencing the course of the electric lines of force. Comparative tests have shown that 8,500 parts can be processed down to normal wear of the tool with the plated boring tools, while it is only possible to obtain 4,500 parts with the non-chromed boring tools. Hard chromium plating has been found particularly effective also for putting back into service used, worn-down boring tools.

Erosion Resistance of Anodic Oxide Films on Aluminum Alloys

N. D. Tomaschow: *Shurnal prikladnoi chimii* (Journal of Applied Chemistry—Russia). Vol. 26, No. 12, pp. 1252-1257.

From comparative investigations which were made on the erosion resistance of anodic oxide films of aluminum alloys, it was found that, with deep anodizing by the process of the Institute for Physical Chemistry of the Russian Scientific Academy, the erosion resistance in comparison with the normal processes can be increased by more than ten times. The surface roughness which is caused by the anodizing can easily be removed by polishing.

Effect of Organic Inhibitors on Solution of Iron in Acids — Pickling Practice

J. Elze: *Metalloberflaeche*. Vol. 8, No. 12, p. 177 (1954).

To clarify the question as to whether an organic inhibitor influences the anodic or the cathodic process the author first considers recent investigations and draws attention to the fact that quinoline is relatively easily reducible and that it is a question perhaps not of an anodic inhibition but of a cathodic depolarization. The author investigated the solution of iron in hydrochloric and sulfuric acids in the presence of Fe^{3+} and Cr^{6+} ions and quinoline and obtained the following values

	Hours		
Addition	*1*	*2*	*3*
Without inhibitor	9.55	17.1	23.7
1 m mol./liter quinoline	9.53	16.99	23.7
10 m mol./liter quinoline	10.0	18.3	25.7

Quinoline accordingly influences the iron solution in the presence of an oxidizing agent only to a limited extent. In a low concentration (1 mol./liter) it only restricts the solution to an insignificant extent; with an increased concentration (10 mol./liter) solution by hydrochloric acid is facilitated. The qualitative course remains the same with a change of oxidizing agent. Quinoline thus imparts a low resistance to the anodic process, the transition of the iron ions in the solution.

In spite of the presence of ferric ions it can still act as a cathodic inhibitor for, with the solution of sulfuric acid with the addition of ferric sulfate, hydrogen generation was still observed. That quinoline has a weaker action with increased concentration indicates that it is reduced and depolarizes the hydrogen deposition. Because of the high efficiency obtained, spray-atomizing evaporators are best for the purpose. Two test installations have been built and have given satisfactory results.

After many years laboratory work, the process for the regeneration of the sulfuric acid from the iron sulfate monohydrate was developed by Fackert (*Stahl und Eisen*. Vol. 74, No. 14, pp. 888-894). Treating with steam under special conditions, sulfur dioxide and sulfuric acid are formed according to the following equation:

$$2FeSO_4+H_2O=Fe_2O_3+H_2SO_4+SO_2$$

It was found that the sulfur dioxide formed can be directly oxidized to sulfuric acid, i.e. with the addition of an oxidizing agent, particularly nitric acid, the reaction proceeds quite easily according to the following composite reaction:

$$2FeSO_4+2H_2O+HNO_3 \xrightarrow{>600^\circ C.} Fe_2O_3+2H_2SO_4+HNO_2$$

The nitrous acid which is formed can be oxidized back in a simple manner to nitric acid so that ferrous sulfate can be processed to iron oxide and sulfuric acid with practically no material loss.

This process would serve to solve two problems. Not only would it deal in a satisfactory manner with the urgent problem of the disposal of waste pickling bath liquors but would also recover the sulfuric acid for further use.

Characteristics and Applications of Chemical Polishing Baths

H. Spaehn: *Metalloberflaeche*. Vol. 6, No. 2, pp. B25-B26.

Chemically polished surfaces are somewhat rough macroscopically but are fairly smooth microscopically (also electron-microscopically). This macroscopic roughness stands in the way of the application of the process to many fields of surface treatment; however there are many fields in which commercial and technically satisfactory result can be achieved by means of chemical polishing. There are parts of complicated shape or broken surface which it is quite impossible to polish mechanically, as for example sieves, wire products, etc. The only other alternative is an electropolishing treatment; this is more expensive than a chemical bright dip bath and in many cases the quality of a chemical polish treatment will be quite sufficient. The process can also compete with mechanical polishing as it serves to cheapen the polishing process.

A considerable field of application for the process lies in the electronic manufacturing industry. Here the characteristic of micro-smoothing is utilized. With the constructional parts of radar tubes, for example, on which high voltages are imposed, the cold emission is reduced after chemical polishing because the parts are levelled with the smallest curvature radius. Mention should be made of a noteworthy characteristic of chemical polished surfaces which occurs with many alloys and polishing baths. This consists of the fact that many surfaces are hydrophobic after treatment. The reason for this requires further investigation as also to what extent the water-repellant properties act advantageously on the corrosion behavior and whether this is disadvantageous to other characteristics.

As regards the reflective characteristics which are obtainable under the optimum bath conditions, the chemical polishing effect is considerably behind that obtainable with a mechanical polishing. The broad and flat shape of curve obtained with chemical polishing-reflection tests allows it be recognized that the surface is inferior to that of mechanical polishing. The angle-reflection curves indicate that these curve forms are characteristic for highly diffuse reflecting surfaces. Practical use is made of this characteristic in the case of aluminum.

Where not-too severe demands are imposed on the surface qualities, as for parts for which a decorative finish is not required, the chemical polishing process has commercial advantage over all other polishing processes because of the lower installation and operating costs. Limitations are set to the process; on the one hand with the surface characteristics for numerous decorative processes and, on the other hand, in the case of large and particularly flat surfaces. Here, the mechanical polishing processes have been so highly developed that neither from the qualitative nor the quantitative aspect are there advantages compared with mechanical polishing. One way perhaps where chemical polishing can enter the decorative field is as a pretreatment to a bright copper plate, followed by a levelling nickel plate. An acceptable surface can feasibly be produced in this way without any mechanical polishing stage.

Sheet Surface and Hot-Dip Galvanizing

H. Bablik: *Metall*. Vol. 7, pp. 849-851.

A decisive factor for hot-dip galvanizing is not the chemical average analysis of the sheet, but the physical and chemical characteristics of the steel surface as it is the surface which actually enters into reaction with the molten zinc. With dry zinc coating processes, the solid iron is hardly attacked by the zinc, as is shown by the following comparison:

Iron loss with wet and dry zinc galvanizing processes with the reaction time ten minutes at 475°C.:

Attacking Melt	*Loss*
Pure $ZnCl_2$ Melts	V + 7 $\sqrt{}$ t
$ZnCl_2$+17%NH_4Cl	V + 375 $\sqrt{}$ t
Fluid Zinc	V + 10.6 $\sqrt{}$ t

A heterogeneous structure of the steel sheet metal surface makes itself particularly noticeable with the dry galvanizing process.

Hard Chromium Plating of Aluminum and Aluminum Alloys

C. Etienne: *Revue de l' Aluminium*. Vol. 31, No. 209, pp. 139-143.

A thick electroplated chromium coating on aluminum and its alloys imparts to the metal good frictional characteristics, considerable hardness, resistance against wear and resistance to alkaline solutions. Aluminum metal as the base material provides lightness, good thermal characteristics and formability. The chromium coatings have little elongation characteristics, can hardly be shaped, and are not shock-resistant.

The coating thickness applied lies, as a rule, between 25 and 150 microns and the hardness at 70 to 75 Rockwell C.

With porous chromium plating, a modification of the process is implied, with which to facilitate the lubrication of the plated surface. As a consequence of the lightness, the good thermal conductivity characteristics and the easy working characteristics together with the chemical resistance, this new material is used with advantage by the engineering, instrument and apparatus industries.

Investigation of Complex Formation by the Method Electro-Conductivity

I. L. Agafonow: *Shurnal Fisitscheskoi Chimii* (Journal of Physical Chemistry—Russia). Vol. 28, No. 1, pp. 147-160.

The specific electrical conductivity of aqueous solutions of copper sulfate and sodium pyrophosphate were measured for various temperature and concentration ranges. With the raising of the concentration of sodium pyrophosphate solution by the addition of copper sulfate, there is first formed $Na_6Cu(P_2O_7)_2$ and not $Na_2CuP_2O_7$ as is often given in the technical literature. With further additions of copper sulfate there is then formed a difficulty soluble precipitate of the complexes $Na_2Cu_3(P_2O_7)_2$ which finally changes into $Cu_2P_2O_7$.

Modern Degreasing, Pickling and Phosphating Layouts

A. Pollack: *Beiztechnik*. Vol. 3, No. 9, pp. 129-132.

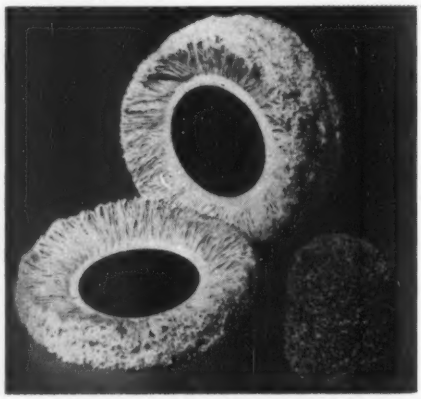
A survey is given of modern practice with degreasing, pickling and phosphating layouts. A typical design example is discussed in detail and amplified with illustrations and technical data. Degreasing plants employing organic solvents such as tri- or perchlorethylene are not described because these units are a special field. Various representative modern German plants are discussed.

Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT
FOR THE METAL FINISHING INDUSTRIES

String Buffs

Schlegel Mfg. Co., Dept. MF, Rochester 7, N. Y.



A new line of string buffs for industrial polishing departments and job shops are claimed to offer a new high in quality and performance at economy prices because they are sold direct from the factory to the user, according to the above manufacturer who has been private-branding quality buffs for many years. Cotton string section wheels and cotton string cup bobs, or goblet buffs, are available in a standard selection of the most popular sizes, or can be made up according to customer's exact specifications.

The new buffs are said to offer several production advantages. The top quality, long fiber cotton strands are far tougher than the re-processed or waste yarn usually used. Therefore they withstand the effect of frictional heat and disintegration many times longer, maintaining their diameter for more sfpm. As the face of the wheel wears, the ends of the virgin cotton fray into millions of fluffy fiber fingers that quickly wipe a mirror finish on metal parts. The section wheels maintain well defined corners, but have a deep pliancy that adapts evenly to the most irregular surfaces and involved contours. The cotton string buffs are easy to clean if necessary, and are particularly recommended for aluminum, brass, silver and soft metal alloys, as well defined corners, but have a deep pliancy that adapts evenly to the most irregular surfaces and involved contours. The cotton string buffs are easy to clean if necessary, and are particularly recommended for aluminum, brass, silver and soft metal alloys, as well as for chromium and steel. The two foremost advantages of the new buffs are their endurance combined with gentle surfacing action, and their quality construction at a low price.

Conversion Coating for Aluminum and Zinc

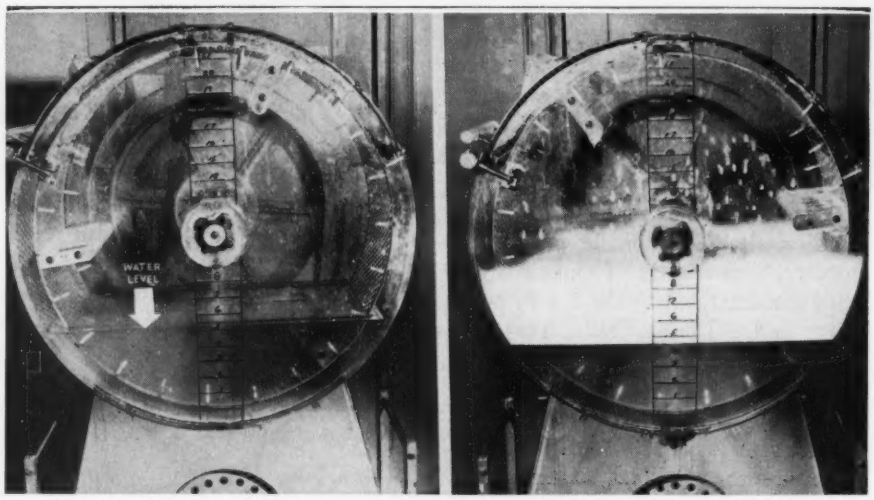
Oakite Products, Inc., Dept. MF, 118 Rector St., New York 6, N. Y.

ChromiCoat, a conversion coating for aluminum and zinc has been designed to meet Specification MIL C-5541. The new product is said to impart resistance against corrosion and to improve paint adhesion. According to the above manufacturers, the coating, which becomes integral with the treated metal surface, reduces paint chipping and flaking. If the surface should be damaged, the treatment is said to confine corrosion within the area of the exposed metal — corrosion does not creep under the undamaged paint to cause blistering.

The material is used at concentrations of 2 to 3 ounces per gallon of water at temperatures up to 100°F. in either tank or washing machine. It is said to be economical in both initial charge and upkeep, and to require no special application controls. Solutions may be held in stainless steel, or polyethylene or Koroseal-lined steel tanks.

Non-Foaming Burnishing Compound

Wyandotte Chemicals Corp., J. B. Ford Div., Dept. MF, Wyandotte, Mich.



As shown by the photos, this new product for burnishing ferrous parts, Burnek 452, is non-foaming even at high concentrations.

Two oz./gal. solutions of this material and another burnishing powder were placed in similar plastic wash wheels to the 5" levels. Wheels were then run for 2 minutes at 36 r.p.m., reversing every 9 revolutions. Photographed immediately after this intense agitation, the new burnishing powder (at left) showed no suds compared to the voluminous suds produced by the other product.

In addition to its non-foaming characteristic, the compound is claimed by its manufacturer to be non-dusty, to produce high luster in minimum time, to be usable in any kind of water and to dissolve completely in cold water—rinse freely with cold water. Lightly soiled work requires no pre-cleaning since the product has detergent properties of its own. The new product has been fully field tested for over 2 years in plants that barrel-finish steel parts prior to plating. It is packed in 400 and 125 lb. steel drums.

Bypass Mechanism for Automatic Machines

Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

A new bypass mechanism automatically controls as many as nine or more complete metal finishing processes on a single anodizing or electroplating machine. The new mechanism is a part of the above manufacturer's "Dial-A-Cycle" system for automatic metal-finishing. This system is controlled from a dial on the carrier arm that moves parts through processing tanks. As unfinished parts are loaded on the carrier, the machine operator sets the dial for the processing steps through which the load is to move. Automatic conveying does the rest, lowering parts into the prescribed tanks, bypassing others, according to the dial setting.

Parts are loaded onto Anodizing Machine that utilizes new Dial-A-Cycle bypass mechanism. Operator sets dial at start of cycle, carrier then bypasses or lowers parts into tanks by means of switches contacting dial at each tank.

Heart of the system is a series of limit switches and solenoid-operated setdown flippers that control the action of the carrier. Different dial settings change the position of a "flag" which subsequently contacts or passes switches and flippers at each tank in the metal finishing sequence.

Advantages cited for the new system by initial users include: 1) cost reduction, since the system on one machine can do the same metal finishing job formerly done by as many as nine machines; 2) reduction of labor costs; 3) improved quality, due to close, automatic control of transfer and immersion periods; and 4) reduction of maintenance costs.

The control mechanism, located at the back of each carrier arm, is set after parts have been loaded at the machine's load-unload station. The operator rotates the dial to the setting prescribed for the raw parts just loaded. This moves a contact flag into one of several positions, in which it contacts or bypasses flippers and switches at each tank.

No further manual operation is necessary until finished parts are unloaded. With bypass features of the system plus timing and process control features of the machine, an almost infinite combination of sequences and dwell periods for cleaning, rinsing, etching, anodizing, plating, coloring and sealing can be achieved.

Cloth and Sisal Multi-Tooth Buffs

Schaffner Mfg. Co., Inc., Dept. MF, Schaffner Center, Pittsburgh 2, Pa.

Two new sectional types of buffing wheels are designed for heavy and medium metal finishing processes for fast thorough cutting and color of intricate contoured metal surfaces. They will cut and color metal in a single operation. Both types of buffs utilize double folded tufts to provide maximum cutting surface and hold buffing compound at the leading edges and on the buff's circumference. Teeth are staggered in a double row around the buff to prevent streaking. This also makes the buff self-ventilating for cooler operation.

All sisal and cloth used in these

buffs is cut on a bias to provide greater strength and longer buff life. This also eliminates the problem of loose ends which can scratch, gouge or cut the surface of the metal to be buffed.

A steel center, composed of two steel disks, provides strong support for each buff. The steel clamps around the circumference of the disks to hold the buff in place. Added strength is accomplished by heavy duty stitching around the buff's inter circumference. The steel disks are multiple spot welded together. A number of venting holes in the steel center assures free circulation of air from the center of the buff to its periphery.

Sisal Multi-Tooth buffs are made of top grade sisal cloth, covered with bias cut cotton cloth. Four rows of stitching of each tooth, plus double fold construction, keeps the cloth from fraying and increases buff life. This buff is suitable for hard and heavy cutting of steel and stainless steel.

All Cloth Multi-Tooth buffs are made of top grades 86/93 bias cut buffing cloth, with each tooth stitched twice to assure greater flexibility of the buff. These cloth buffs can be used for faster, safe cutting-coloring jobs that do not require a buff as sturdy as the sisal buff. The cloth buffs produce a smooth metal finish and can be used on any medium to heavy metal finish job.

The buffs are available in diameter ranges from 10 to 24 inches.

Acid Resistant Work-Clothing

Chem-Wear, Inc., Dept. MF, P.O. Box 1044, Darien, Conn.

The new Chem-Wear combines 68% Dynel with 32% cotton, woven right together to produce a light, tough garment that is far more durable than pure cotton or wool and far more comfortable than pure Dynel. The addition of cotton considerably reduces static that builds up on pure synthetics, causes discomfort and cuts down the wearer's freedom of action. Greater porosity in the weave also is an additional feature that gives the easy, casual feel of regular clothing.

Because the cotton is spun right in with the Dynel, and because there is a greater proportion of Dynel than cotton, the clothing retains its shape, appearance and serviceability even when acids and caustics, or other industrial chemicals, eat away the cotton content. The material is easier to

launder and will withstand years of rough usage and repeated cleaning.

The latest line is available in a complete range of standard sizes.

Surface-Active Agent

Dow Chemical Co., Dept. MF, Midland, Mich.

A new sulfonate-type surfactant with unusually high solubility, stability and surface activity in strong electrolyte solutions is to be marketed as Dowfax 2A1.

An anionic surfactant, it is especially effective in aqueous solutions of acids, alkalies and salts. It is a moderate sudsing agent and is susceptible both to foam boosting and defoaming action. It has effective uses in metal cleaning and industrial hard surface cleaning as well as applications as a detergent or wetting agent.

The product is a light-colored and free-flowing powder and has typically a 93 per cent active content by weight. Its color in a 10 per cent aqueous solution (Lovibond 5¼ inch column) is 63.2 yellow and 6.7 red. It can be used as a wetting agent in plating and electrolytic cleaning according to the above manufacturer.

Non-Ferrous Metal Cleaner

Northwest Chemical Co., Dept. MF, 9310 Roselawn Ave., Detroit 4, Mich.

An entirely new type of water soluble compound has been developed for effective pre-cleaning of non-ferrous metallic surfaces for plating and finishing operations, according to the above manufacturer.

The new compound "449" gives soak cleaning an entirely new aspect as a safe, efficient replacement for solvent cleaning, according to the announcement. The fact that it is a 'single' compound, not a combination of powder and liquid requiring constant attention, is an outstanding advantage. Unusually long bath life makes it attractive from an economy standpoint.

There are no fire hazards in connection with its use. It is also non-toxic and harmless to equipment and rack coatings. Hooding and exhaust systems are not required. The usual disposal problems do not exist, since it can be harmlessly drained off into the sewer. Other advantages are, ease of handling, non-dusting and non-caking in the drum, the announcement adds.

Portable Dust Collecting System

Craftools, Inc., Dept. MF, 401 Broadway, New York 13, N. Y.

This portable dust collecting and shop cleaning system, with well proven ability, is now made in a new model. Model 811 Dustman comes complete with a heavy duty, rugged, fiber drum of 28 gallon capacity. The unit is attached to the drum with a special air-tight locking band easily removable for periodic emptying of the drum.

The cleaner draws in the dirt through the standard hood and 2½" diameter hose. The suction is created by a powerful specially designed 8" pressure type blower. Waste is drawn through the blower and deposited in the waste can. The free air is permitted to escape through a filter bag located on the top of the machine. There are no internal filters that can clog or cut down the efficiency of the machine.

The machine is powered by a ⅓ horsepower, ball bearing capacitor type motor. This motor has thermal overload protection and switch. This unit will operate on any 110-120 volt, A.C. single phase system. This can also be supplied for three phase if required. The unit comes completely wired, ready to plug in. The flexible hose is 2½" in diameter and 6 foot long. The standard hood supplied is designed to fit most machines.

The vacuum cleaner retails for $89.50 complete with drum. Additional accessories, hoods, and dolly are available that increase the versatility of this machine. A free catalog is available.

Oil and Water Extractors

Binks Mfg. Co., Dept. MF, 3122 Carroll Ave., Chicago 12, Ill.

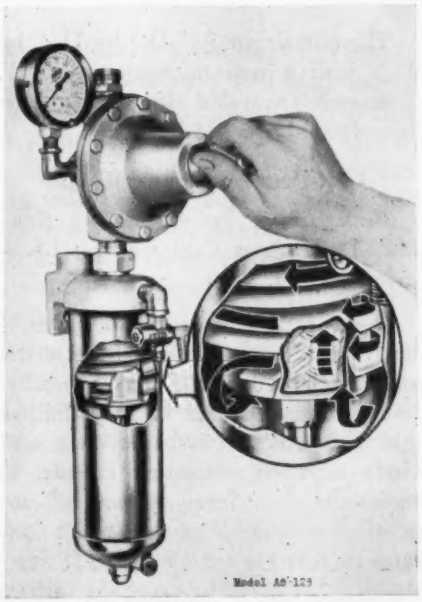
Two new oil and water extractors, featuring an air capacity of 100 C.F.M., are termed ideal for lines where the amount of oil and water is excessively high.

Model AO-125 reportedly supplies up to 100 C.F.M. of clean, dry regulated air to as many as six heavy duty spray guns at the same time. An enlarged and improved air regulator on the extractor is credited for the increased air capacity.

The Model AO-124 is the same as the AO-125 but lacks the air regulator. Designed for use on main lines requiring non-regulated air, its high air capacity results from larger air inlet and outlet sizes.

A unique combination of spiral baffles with special absorbent filters in each of the extractors removes moisture, oil, rust, dirt and other foreign matter from the air before it reaches the spray gun. When dirty, the filter can easily be removed and washed in a petroleum solvent for re-use.

Both models feature an automatic



drain which opens when the air supply is shut off and closes when the air supply is turned on. They are also equipped with manually operated drains.

Acid Additive and Fume Depressant

Swift & Co., Industrial Oil Dept., Dept. MF, 1800-165th St., Hammond, Ind.

A new wetting agent and emulsifier

developed for use as a rust preventive and corrosion inhibitor for steel is also effective as an acid fume depressant in the pickling bath, say its producers.

The new product is called Akweons No. 674 and is designed to be added to any sulfuric, hydrochloric or phosphoric acid pickling solution. It is reported to be readily soluble in acid, alkaline, or neutral solutions.

Originally designed as a rust preventive and as a retardant to acid attack on the basis metal during the steel pickling process, the new wetting agent has shown good results in helping to suppress fumes during the process, say company officials. It is ordinarily added in small quantities directly to the pickle solution as well as to the scrubber acid.

Outstanding features as cited by the above manufacturer include:

Can be used in small quantities.

Helps to minimize loss of basis metal to acid attack.

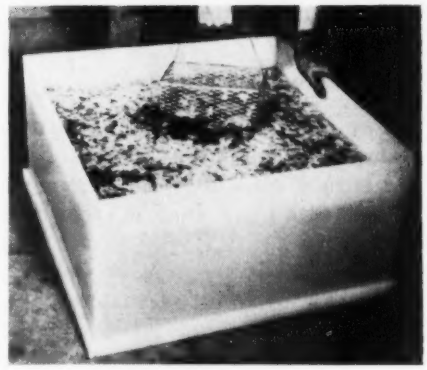
Present users have reported noticeable improvement in reduction of noxious fumes during pickling.

Acid savings of up to 35% have been reported by users.

Polyethylene Tank Floats

American Agile Corp., Dept. MF, 5461 Dunham Road, Maple Heights, O.

Designed to retard the evaporation of liquids in open tanks and vessels up to 70%, and thus greatly increase service life of the solutions, these polyethylene pillows are, in essence, small floating tank covers and, because they are made of polyethylene, offer excellent chemical resistance to a large variety of industrial solutions. They may be used in conjunction with such liquids as nickel and chromium solutions, solvents at room temperatures, reagents, and water.



A 1½" thick layer of pillows is sufficient to retard evaporation, regardless of the solution.

Advantages of the pillows include: virtually unlimited life; chemically resistant to almost all reagents; allow access into the solution without lifting or removal; light in weight — average density less than nine pounds per cubic foot.

The pillows are ⅝" OD by 1¼" by ¼", with a wall thickness of .015". Both ends are sealed after air has been introduced for added buoyancy.

Acid-Proof Silicate Mortar

Pennsylvania Salt Mfg. Co., Dept. MF, Three Penn Center Plaza, Philadelphia 2, Pa.

A new type of corrosion-proof mortar, Corlok, is a silicate bonding material especially designed for the installation and maintenance of stack linings and acid tanks. It is based on a precisely adjusted potassium silicate, is essentially free from sodium silicate or other sodium compounds, and contains no fluoride setting agent. It withstands strong oxidizing acids, nitric, chromic, and concentrated sulfuric, and is resistant to sulfation and highly concentrated acids at temperatures up to 1,900°F. for longer periods than any other acid-proof silicate cement. The product is non-corrosive to metals and will not react with lead or chrome-nickel alloys.

Two materials are used to prepare the mortar—a potassium silicate solution which is entirely new, and a powder packed in 100-lb. polyethylene-

lined bags, dated to ensure best results within a specified time limit.

The above manufacturer recommends this special type mortar for laying acid- proof brick or tile; for structures in which maximum bond strength is essential, and where improved impermeability is desired.

Maintenance Paint

Carboline Co., Dept. MF, 331 Thornton Ave., St. Louis 19, Mo.

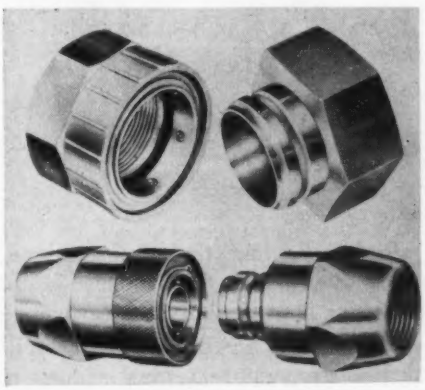
Phenoline 305, a modified phenolic, is catalytically set, having 86% solids content, and applies at 6 mils per coat. The high solids content results in a dense, non-porous film. Coverage is 200 sq. ft. per gallon. It has outstanding resistance to splash, spillage, and fumes of most acids, alkalies and solvents.

The coating can be applied over sandblasted or wirebrushed steel, wood, or concrete. It is recommended for structural steel, equipment, exteriors, ceilings and concrete floors.

Quick Hose Coupling

Roylyn Inc., Dept. MF, 1706 Standard Ave., Glendale 1, Cal.

New all-purpose industrial "Quick" couplings, both open and self-sealing types, are claimed to assure full-flow connections quickly and easily; just a simple twist of the wrist, one-quarter turn, and the coupling is locked or unlocked with a leakproof seal. The couplings are furnished in sizes from ¼" to 3" in steel with other materials available on special order. The ball-locking grooves on the nipple are heat treated to assure longer life and higher pressures, and the nipple length has been increased to withstand greater side-loads.



Further information may be obtained by writing directly to the above manufacturer.

Corrosion-Proof Flooring Material

The Ceilcote Co., Inc., Dept. MF, 4908 Ridge Road, Cleveland 9, O.

Corocrete "A", is a new corrosion proof floor material which is claimed to provide increased protection from attack by alkalies, solvents and acids. Developed for application directly over concrete, the new material is composed of three basic ingredients: (1) a thermosetting resin liquid, (2) a hardening agent and (3) an aggregate-type filler. The new material is mixed at the job site for immediate application. In most instances where conventional coating membranes will be destroyed by solvents, exposing the concrete base to attack by acids, the new product can be used successfully. The protection provided is greatly superior to that offered with most brick flooring and membrane, according to the above manufacturer. It handles like cement topping and is applied in thicknesses from ¼-inch minimum to ¾-inch maximum (per layer). Unlike cement, however, it cures in only a few hours time to a dense, impermeable and non-dusting surface.

This new corrosion-proof material is recommended for existing as well as new concrete floor surfaces. Adhesion to concrete is excellent and installation data indicates that the bond to concrete is stronger than the concrete itself. In addition, abrasion tests show it to be approximately five to six times

more resistant to abrasion than most concrete floors. Its physical strength is approximately four times greater than concrete.

Buffing and Polishing Compositions

Schaffner Mfg. Co., Inc., Dept. MF, Schaffner Center, Pittsburgh 2, Pa.

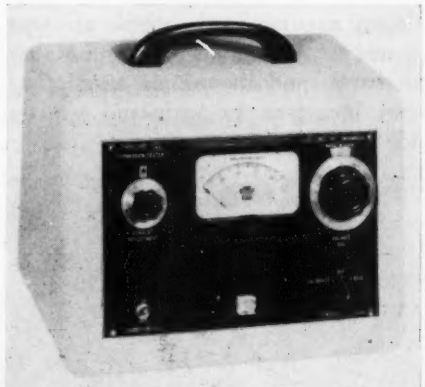
Curved bar buffing compositions are now available for automatic buffing or polishing operations designed to fit curved bar applicators. These bars are available in tripoli, stainless, lime, or coloring compositions. Full range of cutting and coloring powers are available. These bars are 2 inches thick, 4 inches wide, and on an 8 inch radius.

Corrosion Tester

Labline, Inc., 3070-82 W. Grand Ave., Chicago 22, Ill.

The Pure Corrosion Tester (Pats. Pending) is a new instrument to rapidly measure the rate of corrosion in all types of metals subjected to the corrosive effects of various liquids or gases. In the short space of a few hours, users of the tester can predict the amount of corrosion that may take place in five or ten years of field use.

The tester is, basically, a sensitive electronic Wheatstone bridge circuit. Probes have one protected corrosion strip and one exposed corrosion strip. Automatic temperature compensation is obtained from the protected strip. The corrosion on the exposed strip causes the meter to indicate directly in micro inches of corrosion.



Probes holding the protected and unprotected metals are available in all types, for long or short test periods.

Probes also are designed for high or low temperature testing, either in the lab or field. Probes are available for any service.

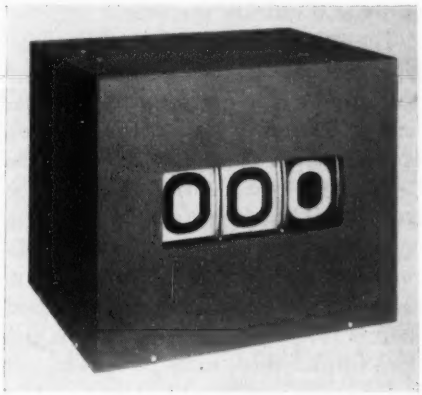
All controls are housed in a steel

case, fully enclosed, with all contacts protected from corrosion atmospheres. Standard models are wired for 115 Volts, 60 Cycles, A.C., but may also be obtained with D.C. converter for field work. Unit weighs only 12 pounds.

The tester may be used to rapidly determine the best materials for various corrosive atmospheres and conditions.

Down-Time Recorder

Down-Time Recorders, Inc., Dept. MF, 1323 S. Wabash Ave., Chicago, Ill.



The Down-Time Recorder records perfectly, to the second, when any production machine is down, no matter what the reason. It plugs in anywhere and automatically resets itself. The 6" letters are visible from up to 200 ft. All-enclosed, fully sealed, accurate, trouble-proof and fool proof, it prevents non-productiveness and costly delays.

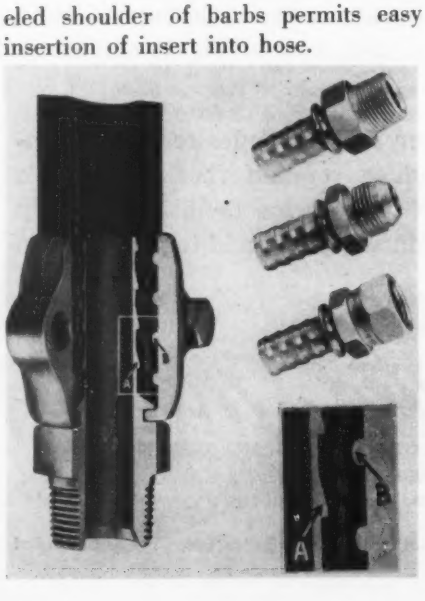
Clamp Coupling

Eastman Mfg. Co., Dept. MF, Manitowoc, Wis.

A new "Inter-Lock" clamp coupling has exclusive grip features obtained by positive positioning of accurately machined insert and clamp. This positive positioning is obtained as the outside rib of the clamp is locked between the collar and hex of the insert, before tightening. The accurate location of the clamp over the insert assures alternate mating of the barbs of the insert (a) with the circular ribs of the clamp (b). The accurate machining of these ribs and barbs permits the hose to be uniformly compressed into each alternating recess — which multiplies the holding power.

Longer service is assured because hose and wire are not pinched or weakened, as they might be if ribs and barbs were located directly opposite each other, and then drawn tight. Bev-

eled shoulder of barbs permits easy insertion of insert into hose.

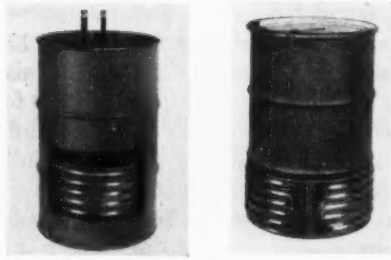


For low, medium and high pressure hose up to 5,000 p.s.i. working pressure, these clamps available for hose sizes ranging from ¼" to 2" I.D. according to pressure requirements and three standard inserts: Male Pipe, Male Flare and Swivel Female. Malleable iron clamp is furnished with heat treated bolts.

Drum Heating Coils

Dean Thermo-Panel Coil Div., Dean Products, Inc., Dept. MF, 616 Franklin Ave., Brooklyn 38, N. Y.

New Thermo-Panel coils have been designed for heating and cooling drums. The curved member, used for immersion in the drum, weights much less than would a pipe coil and is easily



Left: Part of drum cut away to show coil cylinder. Right: curved coil clamped on drum for outside heating.

put in place by hand. When and if cleaning time comes, the device is easily and quickly removed.

The other style is designed for outside heating. It may also be provided with hinges, for quick opening. Other new designs of drum warmers or coolers are called the "platform" and the "slip over" types. All of them can be had in mild steel, or stainless, and in some other metals, for different conditions and services. The above manufacturer lists a number of standard models for the usual 55-gal. drum, but does furnish these units in sizes to suit individual drum or tank sizes.

Centerless Bias Buff

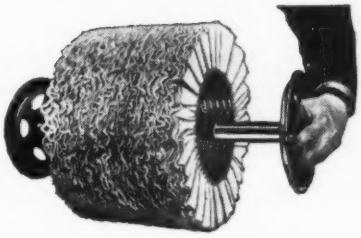
American Buff Co., Dept. MF, 2414 S. La Salle St., Chicago 16, Ill.

A new bias cloth buff is claimed by the above manufacturer to out-last and out-perform all others.

Engineered for high-speed volume buffing on automatic machines, the new buff features an exclusive, patented centerless construction. In this unique design, the cloth is gripped securely by special "Lok-Tite" steel rings, leaving the center completely open for cooler "air-conditioned" running. This permits faster machine speeds without burning, thus greatly increasing production and lengthening buff life.

In addition to holding the cloth in a firm, even grip, the simplified design of the steel clinch ring permits the locking together of an almost unlimited number of sections. This enables the user to build up a buffing face of up to 12 inches or more in width, with complete safety.

Another exclusive feature of the centerless construction is the patented "Pre-Assembly" change-over, which reduces costly down-time by permitting the complete buffing head to be changed in seconds. Individual sections are locked together to required width by means of the metal rings, then mounted on a hollow, telescoping steel



shaft with adjustable flanges. Thus, the entire unit, pre-assembled, can be slipped on or off the machine in minimum time.

The buffs are made from selected materials, in a wide range of densities and grades for cutting or coloring on aluminum, brass, copper, steel, die-cast, plastic, and stainless steel.

Compressively Stressed Nickel Undercoating for Rhodium

Sel-Rex Precious Metals, Inc., Dept. MF, 229 Main St., Belleville 9, N. J.

A new nickel plating process developed by the above company specifically for use with their bright rhodium, is said to produce super, hard and ductile, compressively stressed nickel coatings. Known as Lectro-Nic, the new process counteracts rhodium electroplate's tendency to cracking and peeling, when used as an undercoat.

It is reported that the process will be of particular interest to printed circuit manufacturers, as well as the electrical and electronic industries in general, because it eliminates the peeling and curling common in printed circuits and other precision components which have been plated with ordinary tensile stressed metals. It is claimed that the new deposit offers far greater wear resistance, as well as assuring a more tenacious bond, than is possible by conventional means.

Burnishing Compound For Zinc Die Castings

Oakite Products, Inc., Dept. MF, 118 Rector St., New York 6, N. Y.

A new alkaline burnishing compound for zinc die castings, Oakite FM 186, is an alkaline liquid compound which may be used for self-tumbling or with shot or synthetic media. Recommended concentration of the solution is 1 to 2% by volume. Its use is said to produce a brighter finish and to improve the color of zinc die castings. It is also recommended for burnishing steel and copper and its alloys.

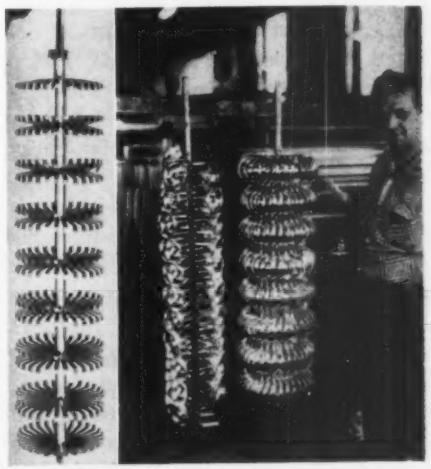
Anodizing Rack

Service Products Co., Dept. MF, 131 N. Green St., Chicago, Ill.

A newly designed anodizing rack can be completely assembled without tools in the plant to handle any job and is said to increase holding capacity as much as 6 times over conventional racks.

The patented new unit utilizes a completely new principle of operation making it extremely simple to handle and virtually eliminates the need for most custom-designed racks. With the simple component parts, it is possible to arrange the rack in hundreds of different ways to accommodate most shapes and sizes.

This same flexibility of arrangement



Shown at left is just one method of tine arrangement on service-rack. Hundreds of others are possible. View at right shows comparison between conventional rack, holding maximum of 40 parts, and service-rack, holding 240 parts.

is particularly valuable in minimizing the amount of space that must be devoted to the storing of special racks. A reasonable stock of parts will permit any shop to make up special racks quickly, obsoleting all special racks stored for re-runs.

The mechanical and electrical contact is positive, uniform and adjustable for wear. Hand-forming of tines to accommodate new parts or to increase the holding power of worn racks is eliminated.

In order to de-rack, it is only necessary to remove the locking wedges and simply shake the rack. In a matter of seconds, the load can be completely de-racked into a water bath. It is absolutely unnecessary to remove parts individually.

To help acquaint anodizers with the many advantages of the rack, the manufacturer has stated that minimum sample orders will be accepted. This will give anodizers the opportunity to try the rack in their own shops.

Bright Silver Process

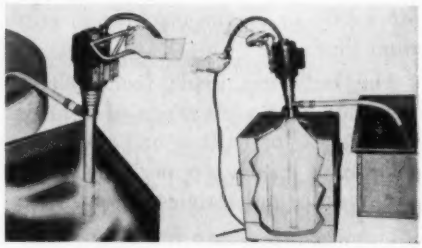
Sel-Rex Precious Metals, Inc., Dept. MF, 229 Main St., Belleville 9, N. J.

The new Silvrex bright silver plating process is said to give a mirror bright finish directly from the bath through a complete range from flash to extra heavy deposits.

Other features of the new process are: hard (Brinnell 135) and ductile deposits; operates at room temperature—less fumes, less tendency toward bath decomposition; noncritical, economical operation and control—operable in a wide range of current densities—from 10 to 40 amperes per square foot; and exceptional throwing power affording uniform thickness of plating even in "blind holes" and crevices.

Portable Electric Acid Pump

General Scientific Equip. Co., Dept. MF, 27th and Huntingdon Sts., Philadelphia 32, Pa.



A new portable electric acid pump conveniently and safely transfers acids from open vessels as well as from standard carboys and drums. All previous pumps of this type were limited to use on closed vessels.

The Centri-F Pump is particularly useful in transferring acids from plating, pickling or small storage tanks. It is completely self-draining. No acid remains in the pump when it is removed from the container, thereby providing absolute operator safety.

Driven by a specially designed, entirely enclosed electric motor, the pump delivers a steady, spurt-free flow of acid at the rate of approximately six gallons a minute. Self-priming and light-weight, the pump is easily positioned and operated by one man. Pump is furnished in materials suitable for the particular acid service specified.

Manufacturers' Literature

Metal Parts Degreaser

Circo Equipment Co., Dept. MF, 51 Terminal Ave., Clark (Rahway), N. J.

Available immediately is a bulletin describing a new metal parts degreaser designated the OP3, and specially designed for cleaning parts that have a tendency to nest or pack, or parts that have recesses difficult to penetrate with a hand spray.

The bulletin describes the unit's corrosion resistant construction features, operating characteristics, and solvent flow and distilling action. The auxili-

ary equipment and interchangeable heating systems are also described. Schematic full view drawings and tables of specifications for all eight basic models in the series contain inside and overall dimensions, work load data, solvent capacity and thermal input requirements.

Dust Collectors

Torit Mfg. Co., Dept. MF, 292 Walnut St., St. Paul 2, Minn.

A standard envelope-size booklet titled "You Can Solve That Dusty Cost Problem" describes the principles of unitized dust collection, its advantages and savings.

Illustrated with cartoons, cutaways and product photos, the booklet, No. 56, describes dust damage, general product information, uses and reductions in operational expenses. A photomicrograph of various types of industrial dust is also included.

Nickel Undercoating for Rhodium

Sel-Rex Precious Metals, Inc., Dept. MF, 229 Main St., Belleville, N. J.

A ten-page technical paper, describes the new Lectro-Nic compressively stressed nickel plating process. Developed specifically as an undercoating to counteract rhodium electroplate's inherent high stress characteristics, the process, as described in the literature, utilizes only one addition agent with all other operating conditions being identical to conventional nickel plating.

The new literature treats such important subjects as: plating solution composition and operating conditions; make-up and control; analysis and properties; and how to gauge the rate of consumption of the addition agent.

Chromium Plating Additive

Diamond Alkali Co., Chromium Chemicals Div., Dept. MF, 300 Union Commerce Bldg., Cleveland 14, O.

A new, informative fact-file folder concisely reviews a recently developed chromium plating additive for both decorative and hard-chromium applications.

Printed in three colors on cover bristol paper stock with a 1/8-in. score for conveniently filing technical service bulletins and related data, the four-page folder briefly describes "CPA 1800." It outlines how and why this development contributes to faster chromium plating, broader operating range and greater covering power of chromium-plating baths, brighter and harder deposits, and easier anoding in hard-chromium plating.

Supplementary technical data, presented in either convenient chart or graph form, covers composition of both decorative and hard-chromium plating solutions using this additive, range of bright chromium deposits obtained, and effect of current density on plating speed of such baths.

Portable Rotator Drum Truck

Morse Manufacturing Co., Inc., Dept. MF, 727 West Manlius St., East Syracuse, N. Y.

A two-page bulletin, No. 1153, describes the above manufacturer's Deluxe 500 Portable Rotator drum truck. Safely rotating at fixed speeds drums weighing up to 500 lbs., the drum truck revolves a one or 55 gal. container with equal ease.

Teflon Products

Crane Packing Co., Dept. MF, 6400 Oakton St., Morton Grove, Ill.

A new 12-page brochure on Chemlon, "John Crane" products fabricated from DuPont Teflon, Form T-110, gives valuable information on that remarkable material as well as many applications for which it can be fabricated. Included in the text are data on properties, complete specification table and descriptions of fabricated products, together with operational and service data.

A wide variety of products are de-

scribed, such as mechanical and hydraulic packings in both braided and molded types; special hydraulic packings; FreeFlow envelope type and solid gaskets; "O" rings; flexible bellows; sheet, rod, tubing and tape; molded and machined parts; and electrical/electronic parts and insulation.

Continuous Abrasive Blasting

Pangborn Corp., Dept. MF, Hagerstown, Md.

All producers and users of hot rolled or heat treated steel sheets, plates and coils will be interested in the new 16-page brochure, No. 608, describing equipment for continuous, mechanical descaling by shot blasting. Thirty-six photographs and drawings illustrate details of construction, actional installations and specifications.

Equipment to descale sheet 60 in. wide at speeds of from 10 to 195 lfm. using from two to eight Rotoblast abrasive throwing wheels is described.

Savings in space and processing over pickling are documented. The higher efficiency of directing the blast stream at 78° instead of 90° is diagramed.

Electronic Thickness Tester

Kocour Co., Dept. MF, 4800 S. St. Louis Ave., Chicago 32, Ill.

An illustrated booklet which gives questions and answers on the above firm's electronic thickness tester has just been published.

Written in simple form for quick reading and ready reference, it also lists information regarding the tester, an index to the questions, and a partial list of users.

Vapor Degreasing Methods and Techniques

Circo Equipment Co., Degreaser Div., Dept. MF, 51 Terminal Ave., Clark (Rahway), N. J.

A definitive 24-page manual describes use, operation and maintenance of all types of vapor degreasing equipment.

Illustrated profusely, the manual features perspective drawings of the above manufacturer's degreasing equipment with cut-away schematic drawings.

Separate pages are devoted to installation, operating techniques, accessory equipment, trouble-shooting and solvent recovery. A special section is set aside for solvents, service, metal washing equipment and ultrasonics.

Airblast Cleaning Cabinet

Pangborn Corp., Dept. MF, Hagerstown, Md.

A new bulletin (No. 607) describes the EN-2 blast cleaning cabinet for small or intermittent work. The new 8-page brochure contains fifteen photographs and drawings illustrating the airblast cabinet. Two tables present dimensions and specifications.

Roof Ventilators

Hartzell Propeller Fan Co., Dept. MF, Piqua, O.

A revised catalog, Bulletin A-112A, covers the above manufacturer's line of roof ventilators.

The catalog contains complete information on the reversible roof ventilator as well as the penthouse, vertijet, airjet and rotary roof ventilators. Sizes, specifications, performance data, and dimensional drawings are shown.

Hose Fittings

Hose Accessories Co., Dept. MF, 2700 No. 17th St., Philadelphia 32, Pa.

An eight-page profusely illustrated booklet covers all Le-Hi hose couplings, hose clamps, hose nipples, valves and manifolds. Entitled Condensed Catalog No. 18, it is only brief in the time it saves the reader. Tells all you need to know about every type, size and classification and even includes parts numbers.

Barrel Finishing Methods and Materials

Oakite Products, Inc., Dept. MF, 118 Rector St., New York 6, N. Y.

A folder describing barrel finishing methods and materials is designed to give metal fabricators an over-all view of the problems and requirements inherent in this fast-growing method of finishing metal. The subject is discussed from pre-cleaning to final rinse. Knowledge gained from actual in-shop experience is applied to the use of cutting and descaling solutions, picking the right finishing materials, alkaline vs. acid type compounds, burnishing solutions, water levels, and media-to-work ratios.

In addition, the folder discusses the barrel finishing materials recommended for the various procedures. It explains, for instance, why an alkaline, abrasive material is suggested for deburring stainless steel; how a recently developed rinsing aid helps prevent water spotting on finished surfaces, and gives temporary rust protection.

Airless Abrasive Blasting

Wheelabrator Corp., Dept. MF, 1150 South Byrkit St., Mishawaka, Ind.

The use of airless abrasive blast cleaning upon shell molded castings is the subject of a new piece of literature. Explaining that shell moldings need to be cleaned of sand, scale, discoloration, and grinding lines, the booklet points out 3 illustrated case histories where airless abrasive blasting is used for this work. Performance rates are given.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Newark Branch

The June 9th meeting of the Newark Branch was held at the Hanson-Van Winkle-Munning plant in Matawan after a dinner attended by over sixty members and friends at the YE Cottage Inn. The dinner was so much enjoyed that the plant invitation under the direction of *James Viola, Ross Lyons, Clint Ivins* and *Ray Dennison* got off to a late start. As a result, at the conclusion of the visitation to the generator and rectifier manufacturing facilities, it was decided that the double-barrelled program calling for Ross Lyons to discuss "Generator Applications" and Clint Ivins to talk on "Rectifier Controls" would be postponed until some later date.

The business meeting under President *Clifford Struyk* found all officers except *Fred Meyer* and *John Gumm* present. Secretary Foulke announced the reecipt of a communication from President Kelly announcing the appointment of *John Nichols* as new national executive. *Walden Casler, Joseph Cirello, Jack Gubnitsky, William Jubanowsky, Patrick Kearns* and *George Urucinitz* were elected to membership.

President Struyk announced the appointment of *Flavio La Manna* as editor of Newark Sparks and thanked *Al Korbelak* for a job well done over the past several years. *Milton Stevenson*, secretary of the Syracuse Branch and *Joseph Cheung* of Hong Kong were introduced to the members. Treasurer *George Wagner* reported all bills paid and the audit of the 1955-1956 books to be done at the next educational committee meeting on June 27th.

The secretary announced that it was with deep regret he had to report the passing of *Frank Barile*—a long time member of the branch.

The condition of past president *Myron Diggin* who was stricken with a heart attack early in the week was re-

ported good and regrets expressed that he could not attend the meeting.

The meeting concluded with the better than eighty members and guests enjoying an hour of refreshment courtesy of the Hanson-Van Winkle-Munning Company.

D. Gardner Foulke
Secretary

Los Angeles Branch

An impromptu panel discussion, which was arranged at the last minute by Librarian *Emmett H. Babcock* when the programmed speaker was prevented from attending, provided Los Angeles Chapter with an educational hour of wide scope on the advantages of various types of filtering media at its June 13 meeting at the Roger Young Cafe in Los Angeles.

Kenneth C. Johnson, field engineer of Industrial Filter and Pump Mfg. Co., Chicago, had been scheduled to present a talk on "Filters and Filtration." When Johnson was delayed beyond the meeting hour on his return from a San Francisco trip, Babcock drafted a panel of plating industry men to conduct a forum discussion on the subject of filtering.

Chosen for panelists were *Earl Arnold* of L. H. Butcher Co.'s plating service department; *Gilbert Extale*, plating superintendent for General Electric Co.'s Ontario, Calif., plant; and *Tony Stabile* of Associated Platers, Los Angeles.

Each of the panelists presented an extemporaneous outline of the advantages of various types of filters, each introductory talk being preceded by an overall discussion of why filtering is necessary to produce a high quality plate.

Questions fired at the panel members dealt with the advantages of horizontal versus vertical types of filters; the differences between the two types; what effect filtering has on addition agents in the solution, and numerous others.

At the opening of the business session, Branch President *L. Truman Stoner* called on *Joseph Simon* of Librascope, Inc., Glendale, Calif. to step forward to receive the A.E.S. past-president's pin which had been forwarded by the national office. Simon was president of Bridgeport, Conn., branch in 1955, but moved to Southern California before the expiration of his term.

Among the guests receiving a special introduction by President Stoner—and destined to be the only woman member of Los Angeles Branch—was *Mrs. Vonna F. Ott*, founder, owner and operator of Products Engineering Service, an electroplating firm in Pasadena specializing in printed circuitry for the electronics industry. Stoner explained that Mrs. Ott, a former nurse, established her plating shop three years ago and actively directs it herself. She filed an application for membership at the June meeting.

Another distinguished guest was *Lou Barkley*, 1955 president of Kansas City, Mo., branch, who is now in the plating department of North American Aviation, Los Angeles.

Other guests included the following: *Trevor Perry*, Wildberg Bros.; *Edward Wesson*, Felker Mfg. Co., Torrance, Calif.; *A. E. Miller*, Kelite Products; *Andrew C. Cattal*, Recodezising Co.; *Downing Morgan*, A&S Metal Finishing Co., South Gate, Calif.; *Gilbert Extale, Jr.*, Ontario, Calif.; *R. W. Watt*, Trophycraft, Inc.; *Joseph Bernier*,

Rocketdyne Co.; *B. W. Beeson*, Hall-Mack Co.; *Ronald Scott*, Collins Engineering Co.; *Richard Rathburn*, Lumidor Corp.

In addition to the initiation of four new members at this meeting, applications were received from ten others. They were: *Mrs. V. F. Ott, Norman W. Green, Dr. Joseph S. Swenko, S. E. Nesowill, Anthony Pallago, William A. Zube, John W. Hensley, Downing Morgan, Anthony Carrera* and *David L. Angel.*

The June 13 meeting closed out Los Angeles Chapter's pre-vacation series of meetings. No sessions will be held in July and August. The branch will resume meetings on September 12.

Chicago Branch

Despite an early summer heat wave and the interference of vacation schedules, Chicago Branch had a surprisingly good attendance at its last regular meeting of the year held on June 8. Considerable credit should be given to the speaker, *J. C. Hesler* of Industrial Filter & Pump Mfg. Co., and to his subject "Recovery and Treatment of Metal Finishing Wastes."

Mr. Hesler was a very capable speaker and made a good coverage of his subject. To aid the members in following the discussion and to carry home the important points, he passed out pamphlets pertinent to the points under discussion. He discussed the various types of waste materials usually handled, principally nickel, chromium, and cyanide type solutions, and how they could best be recovered or disposed of. Undoubtedly all of the members were impressed with the seriousness of the problem and the fact that it can be solved.

All members were encouraged to attend the National Convention in Washington, and reminded that the presiding officer of this year's convention, *Clyde Kelly*, is a member of Chicago Branch, and that among the many excellent papers to be presented was one. "Gold-Silver Alloy Plating," by two members of Chicago Branch, *R. E. Harr* and *A. G. Cafferty* of Western Electric Co., Inc.

Several comments were heard to the effect that Dick Saltonstall of Udylite Corp. made a very good presentation of his subject, "The Role of A.S.T.M. Committee in the Electroplating Industry" at the May meeting of the Branch.

All members were wished a happy vacation time and reminded that they should not forget to send their dues to the secretary before they take off for that fishing trip.

Joseph Corré
Publicity Chairman

METAL FINISHING SUPPLIERS' ASSOCIATION

Using the Calloway Handicap system, five contestants tied for low net honors with 72's: Phil Borell, Allied Research: Miss Jean Conner, National Bureau of Standards; Joe Eisele, Enthone; Bill Innes, MacDermid, Inc.; and Ed Mahar, Glidden Company. Displaying a well balanced game, Joe Wagner of Wagner Brothers carded a 78 to lead the field in low gross scores in the 1956 MFSA Golf Tournament. Each received a handsome prize.

Scheduled for June 19th in conjunction with the AES Convention in Washington, this year's event was held on the Manor Country Club course at Norbeck, Maryland. Joe Duffy, Pennsalt, served as Tournament Director. The entry list topped all previous tourneys.

NAMF

Executive Committee is shown during annual meeting of *National Association of Metal Finishers* in Washington, D.C., June 18. Left to right: *Peter Kovatis*, Executive Secretary; *Webb B. Knight*, Detroit, 2nd vice-president; *J. Robert Greenwell*, Chicago, 1st vice-president; *John A. Palik, Jr.*, Cleveland, president; *Sal Novelli*, Brooklyn, assistant secretary-treasurer; and *Frank Kaiser*, Long Island, secretary-treasurer.

BUSINESS ITEMS

Permutit Appoints J. A. Meindl

The Permutit Co., New York, announces the appointment of *J. A. Meindl* as sales representative for the *Permutit Co. of Canada, Ltd.* in Toronto, Ontario. Mr. Meindl has served as the Montreal sales representative for the past ten years. He is a member of the AWWA, the Institute of Power Engineers and a Lieutenant Colonel in the Canadian Militia. He will now be located in the Toronto Office at 207 Queen's Quay.

At the same time, *J. M. Watson* has been appointed to succeed Meindl as sales representative for the Montreal Office. Mr. Watson is a graduate of McGill University where he received his degree in chemical engineering. After graduation in May 1950 he joined the company, working out of their Montreal office as assistant to Mr. Meindl. Mr. Watson is a member of the Engineering Institute of Canada and the Corporation of Professional Engineers (Quebec Province).

International Rustproof Moves

International Rustproof Corp. announces the removal of their offices, laboratories and factory to new and larger quarters at 1575 Merwin Ave., Cleveland 13, Ohio. The new telephone number is MAin 1-2864.

AZI Appoints Battelle Memorial Institute for Zinc Research Project

Battelle Memorial Institute has been recently commissioned by the *American Zinc Institute, Inc.* to undertake a research project covering new and improved finishes for zinc die castings. The projected research program will include investigations to establish ways and means of anodizing and dyeing zinc die castings as well as a program aimed at improvement and economy in current plating and other finishing operations.

The new project will be directly supervised by an AZI committee to include *E. A. Anderson* of The New Jersey Zinc Co., *A. A. Smith*, American Smelting & Refining Co. and *R. C. Bell*,

Consolidated Mining & Smelting Co. of Canada, Ltd. Advisers will include *M. R. Caldwell* of Doehler-Jarvis Div., National Lead Co., and *M. Diggin,* Hanson-Van Winkle-Munning Co.

Pennsalt Expands Operations in Mexico

As an integral part of its projected five year growth program, the *Pennsylvania Salt Mfg. Co.* has announced further expansion of its operations in the Republic of Mexico. Nearing completion at Navojoa, Sonora in the northwestern area is a new agricultural chemical processing plant and distribution center. This plant provides an expansion of Pennsalt de Mexico's central plant and office facilities in Mexico City and establishes another base for the eventual distribution of the company's full line of more than 400 chemicals for industrial, farm and home use in the rapidly expanding economy of the west coast of Mexico.

New Gen'l Sales Mgr. for Metal & Thermit

A. James Fisher has been appointed general sales manager of *Metal & Thermit Corp.* In his new post, Mr. Fisher will supervise sales of all company products, reporting to *H. D. McLeese,* vice-president.

Mr. Fisher brings to his new position a background of twenty years experience in industrial chemical sales. From 1936 to 1950 he was connected with U. S. Industrial Chemicals, Inc., as manager of the New England Sales District and later of Chemical Sales Development. From 1950 to 1955 he was associated with U. S. Polymeric Chemicals, Inc., as vice-president and president. He joined the Metal & Thermit organization in February, 1955, serving as technical advisor to the president.

Mr. Fisher was graduated from Princeton University and is a member of American Chemical Society.

Graver Opens New Sales Office in Boston

Graver Water Conditioning Co., New York, N. Y., has just announced the opening of a new sales-service office in Boston, Mass. to service the New England area. The office will be located at Room 707, 6 Beacon St., Boston, Mass. Telephone: Capitol 7-9414.

William A. Homer will be district manager in charge of this office and will handle the firm's complete line of industrial and municipal water treatment and industrial waste treatment equipment.

Mr. Homer, who graduated from the University of Maryland with a Mechanical Engineer degree, is well versed in all phases of this work. He has had a great deal of practical experience with power plant operation, equipment design and water and waste treatment processes. He has been with the company since 1952 in their customer service dept., where he obtained a practical working knowledge of their equipment, and their sales engineering dept., where he designed and selected equipment and processes for all types of water waste treatment problems.

Kelite Appoints Dr. Spring

Kelite Corporation, Berkeley Heights, N. J., manufacturers of industrial chemicals, has appointed *Dr. Samuel Spring* as laboratory director.

A. James Fisher

Dr. Samuel Spring

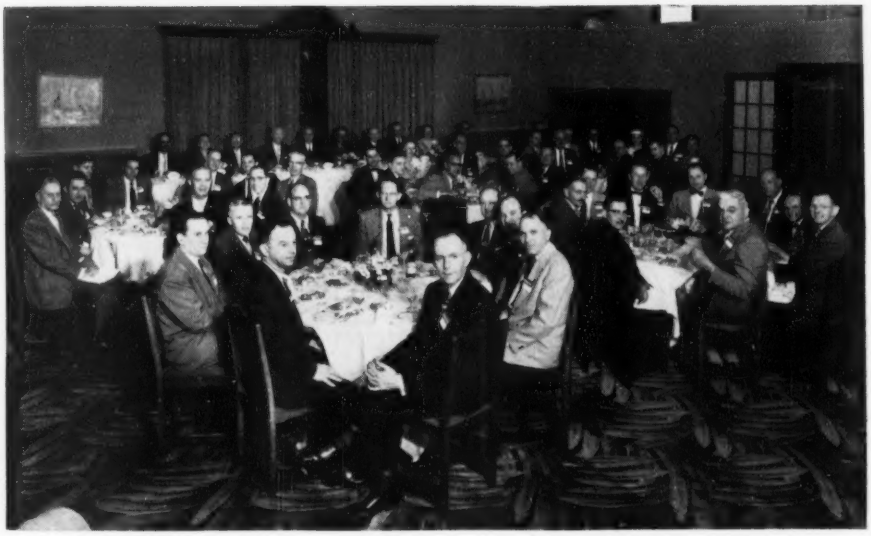
Dr. Spring was formerly associated with the Pennsylvania Salt Mfg. Co. and Frankford Arsenal. Prior to that he conducted classes in chemistry at City College of New York.

Dr. Spring has authored many articles on the subject of metal cleaning, detergency, phosphatizing and metal-drawing lubrication. He is now chairman of a section of A.S.T.M. Committee B-8 which covers cleaning prior to electroplating.

Udylite Holds Party

The Udylite Service Club is shown at the annual party recently held at the Detroit Yacht Club, in Detroit, Mich.

The club is made up of men and women employees who have been constantly employed by the organization for 15 years or more. There are 57 members of the service club representing 1,150 years. These employees were called in from all over the country to attend this party. The greatest length of service is represented by *L. K. Lindahl*, chairman of the board, with 31 years. There were 10 employees at the head table all of whom had service of 25 years or more.



At this party, 4 gold watches, commemorating 20 years of service, were given to *Dr. R. B. Saltonstall*, technical director, *H. J. Ward*, Michigan district sales manager, *W. Jackson*, head of plating barrel engineering department and *V. E. Zobel*, director of purchases. In addition there were 7 service pins presented recognizing 15 years of service.

New Appointments by Circo

Circo Equipment Co., a leading manufacturer of cleaning equipment for the metal working industry announces the following appointments:

Stanford J. Barlett is manager, Washer Division. His responsibilities with the Rahway, N. J., firm will include complete supervision in sales, design and manufacturing metal parts

Stanford J. Barlett

Walter J. Reinecker

washers and dryers or complete finishing systems.

Following service in the Production Branch of the USAF's Air Materiel Command, with the rank of Lieutenant Colonel, Mr. Barlett has had ten years' intensive experience in all phases of metal finishing, anodizing and paint finishing techniques. Both his military and civilian activities provde insight into procurement and engineerng sales-service with the emphasis on metal parts washer systems.

Mr. Barlett, a resident of Riverdale, New York, is a science graduate of Ohio State University and a member of the American Society of Mechanical Engineers.

Walter J. Reinecker has been appointed chief engineer, Sonic Division. A mechanical engineer, he joined the firm in the newly created post he now holds, after having gained more than five years experience in research and development of in-plant operating equipment. He will be responsible for proceeding with further developmental work along ultrasonic lines already established by the company.

A graduate of Rutgers University, Mr. Reinecker also holds an M. A. from Newark College of Engineering. He is a member of the New Jersey State Society of Professional Engineers.

New Officers Elected at Park Chemical

At a recent directors' meeting of *Park Chemical Co.*, the following men were elected officers by the board: *H. D. Kitchen*, formerly secretary and treasurer, to executive vice-president and secretary; *C. R. Foreman* to vice-president in charge of sales; and *Robert J. Mitchell* to treasurer.

Wagner Appoints Cincinnati Area Manager

Wagner Brothers, Inc., Detroit manufacturers of automatic plating machinery, equipment and chemicals, has announced the appointment of *Kenneth Edstrom* as district manager of its new Cincinnati branch, covering Southern

Kenneth Edstrom

Ohio, Kentucky, Tennessee, Virginia and West Virginia. The Cincinnati office is at 2904 Woodburn Avenue.

Mr. Edstrom has been a sales engineer for two years in the Chicago branch. Prior to joining the firm, he was with Mall Tool Co., and Great Lakes Plating, as metal finishing supervisor. He attended Hibbing Junior College and Northwestern University, majoring in chemical engineering.

Stokes Changes Its Company Name

F. J. Stokes Machine Co., Philadelphia, Pa., changed its name to *F. J. Stokes Corp.* on July 1, following the company's recent annual meeting at which stockholders approved the change. The new designation was selected as being more in keeping with the broad range of the company's interests and the varied line of production and processing equipment which it has developed during its 60 years of growth.

Burchfield and Spicer Appointed by Inco

William F. Burchfield has been appointed supervisor and *Kenneth M. Spicer* assistant supervisor of Technical Service in the *International Nickel Co.'s* Development and Research Division.

Mr. Burchfield has been serving since 1947 as assistant director of Technical Service under *Dr. W. A. Mudge*, whose appointment as the company's special representative on educational programs was announced recently.

Mr. Burchfield has been with the division since 1929 following four years with a predecessor company, American Mond Nickel Co., prior to which he had attended Lafayette College, Easton, Pa. He is a member of the American Society of Mechanical Engineers, the Institute of the Aeronautical Sciences, Society of Automotive Engineers, Society of Naval Architects and Marine Engineers, The American Boat and Yacht Council, American Society for Metals and American Welding Society.

Mr. Spicer joined the firm in 1928 as a welding engineer and has devoted most of his attention to technical and practical work on the welding of nickel and nickel-containing alloys as a member of the Technical Service Section. He holds memberships in the American Welding Society and the Canadian Welding Society.

Fair Practices Committee Established

The Utrasonic Mfrs. Ass'n announces the formation of its Fair Practices Committee for the establishment of standards of ethical and sound practices in the dissemination of information about applications of ultrasonics. All of the charter members of the newly formed association are partici-

pating in this new group that will help the rapidly growing ultrasonic industry to present accurate information concerning the application of ultrasound in all branches of industry.

The new group will suggest fair sales and publicity practices to its members. It will help to disseminate accurate educational information to the press and technical publications. It will act to insure that proper and correct information on ultrasonics will be presented by U.M.A. members at all times.

Free Course in Electroplating

The course of study in electroplating given at the Fort Greene Evening High School, 29 Fort Greene Place, Brooklyn, N. Y., (formerly Brooklyn Evening Technical High School) will begin its fall term on September 12, 1956.

The session is divided into classroom discussion and laboratory experiments. The classroom topics will include simple calculations, reading graphs, chemistry of the plating tank, pH, wetting agents, pitting, deionizing. The laboratory experiments will include solution analysis, Hull cell studies, anodizing.

Registration begins September 10, 1956, and daily thereafter from 7:00 to 9:00 P.M. Classes will meet on Mondays and Wednesdays from 6:45 to 8:15 P.M. including about six (6) Fridays. The term begins September 12 and ends January 31, 1957. Register with *Mr. L. Serota* in Room BW17 or 3E10.

Canton Platers Supply and Bison Corp. Merge

Canton Platers Supply Co. and *Bison Corp.* have completed their merger which has resulted in a change of the official company name to *Bison Corporation*.

Bison Corp. will continue to operate the Canton Platers Supply Co. as one of its divisions, along with the buffing wheels manufacturing division which makes the Bison "Ventex" bias type ventilated buffs.

Southeastern States Get New Infilco Representative

Infilco, Inc. announces the movement of *Ed Crowley* to the Atlanta area. He has been with the company for almost five years. Before that time he spent thirteen years in the paper and pulp industry in Houston and Minneapolis.

Ed Crowley

Mr. Crowley will take his position at once and specialize in the fields of municipal and industrial water supplies and waste treatment.

E. E. Troyer New Head of Tamms

At a meeting of the board of directors of *Tamms Industries, Inc.*, on May 11th, *E. E. Troyer* was elected

E. E. Troyer

president of the corporation. Mr. Troyer joined the firm in March of 1934, and, in January 1944, was made vice-president. In January of 1945 he was advanced to executive vice-president. He is a member of the Rotary Club and the Builders Club of Chicago. He resides in Wilmette, Illinois. The board also appointed *Mrs. Frieda Gerretson* treasurer and *H. P. Barber* secretary.

Stauffer Chemical Purchases Half Interest in Major Phosphate Rock Mining Concern

Stauffer Chemical Co. announces it has purchased a 50% interest in the *San Francisco Chemical Co.* from its parent, *The Mountain Copper Co., Ltd.* of London, Eng. San Francisco Chemical, one of the pioneer mining concerns in the Rocky Mountain area, is a major western producer of phosphate rock. During the past several years it has been Stauffer's primary supplier of phosphate rock.

At present, San Francisco Chemical Co. operates its own mine at Montpelier, Idaho. It also mines a Stauffer-owned claim in Southwestern Wyoming and has conducted an extensive development program on Stauffer claims and leases near Hot Springs, Idaho. The Hot Springs work has already proved up large reserves of commercial grade phosphate rock. Other promising deposits are leased by San Francisco Chemical in Utah's Crawford Mountains.

New Quarters for Van Straaten

Van Straaten Chemical Co. has moved its sales headquarters and main laboratory into new quarters in its own two-story building at 630 W. Washington Blvd., Chicago. The company makes metal cleaning compounds.

Beckman Acquires Lou-Bar Products

Acquisition of *Lou-Bar Products*, manufacturer of precision components for automatic control systems, has been announced by *Beckman Instruments, Inc.*,

The transaction involves the entire physical assets of Lou-Bar, located at 938 Pico Blvd., in Santa Monica. Terms were not disclosed.

Dr. J. T. Benedict Joins Inco's Bayonne Research Lab.

Dr. Joseph T. Benedict has joined the staff of the Bayonne Research Laboratory of *The International Nickel Co., Inc.*, as a member of the Electrochemical Section. The Electrochemical Section devotes its efforts to various activities in the field of electrochemistry, particularly to research aimed at improving the process of nickel plating and the physical properties of nickel coatings.

Born in Chicago on May 21, 1920, Dr. Benedict was a student at the University of Chicago in 1940-43 and on graduating joined the Manhattan Project at the University. He entered the graduate school at the Massachusetts Institute of Technology in 1946 and, in 1950, received his doctorate in inorganic chemistry.

In 1954, Dr. Benedict joined the Nickel Processing Corp and studied the factors which influence nickel-cobalt separation.

He is a member of the American Chemical Society, Sigma Xi, the International Society of General Semantics, and the M.I.T. Club of New York.

New Trane Sales Office Opens at Albuquerque

The Trane Co., manufacturing engineers of air conditioning, refrigeration, heating, ventilating and heat transfer equipment, has announced that *Gary Mays* was appointed sales representative in charge of a new sales sub-office in Albuquerque, N. M.

The sub-office of the Denver, Colo., sales office is located at 3217 Silver Street SE. Telephone number is 6-0391.

Mays received a bachelor's degree in business administration from West Texas State College and graduated from the company's student training program. Previous to his Albuquerque appointment, Mays was a sales representative with the Denver sales office. His military duty included two years in the armored division of the U. S. Army as communications chief.

Sulphur Products Now in McKeon Building

Sulphur Products Co. of Greensburg, Pa., has moved its main offices from 228 McKeon Way to the McKeon Building at 621 West Pittsburgh St.

This change was delayed by the sudden death of *Wilfred S. McKeon*, who had made the plans prior to his death in April.

Additional warehouse space at the new location will enable the company to maintain greater stocks and insure better service to its many customers throughout the continent.

Kelite Promotes Bartholomew

Norman E. Bartholomew, formerly sales supervisor in Detroit for *Kelite Corporation*, manufacturers of industrial chemical and steam cleaning equipment, has been promoted to district sales manager of the Detroit district.

Norman E. Bartholomew

Mr. Bartholomew has been associated with the organization since 1946. Prior to this association, Bartholomew was manager of Miller and Banker in Chicago.

New Technical Service Manager Appointed by Speer Carbon Co.

Speer Carbon Co. has announced the appointment of *Millard S. May* as man-

Millard S. May

ager of technical services for the company's Carbon Products Division. Mr. May has been sales manager of this division for the last five years.

Graduated from Rensselaer Polytechnic Institute in 1920, as a chemical engineer, he joined the company the same year. Since then, Mr. May has headed up an electrical testing laboratory, development laboratory, and the company's inspection and sales engineering programs.

Mr. May is a member of the A.I.E.E. and A.I.S.E. He also is a charter member of the Emporium section of the I.R.E.

Kriewall Joins American Agile

William "Bill" Kriewall, formerly associated with the Permagile Corp. of America, New York, has joined the *American Agile Corp.*, Cleveland, as sales engineer.

William "Bill" Kriewall

Prior to his association with Permagile, Kriewall was with the Eutectic Corp., New York, in research and development activities.

In his new post, he will service all company accounts in southern Ohio and western West Virginia.

Hooker Announces Sales Department Changes

Hooker Electrochemical Co., Niagara Falls, N. Y., has now completed integration of the Niagara Alkali sales department into the Hooker sales department. Several resulting personnel changes in the group under the direction of *John S. Coey*, Eastern sales manager, are announced.

Herbert Heesch, formerly general sales supervisor, has been appointed manager of chemical sales. Mr. Heesch first came to the company in 1933 for four years following graduation from the University of Rochester with the degree of bachelor of science in chemical engineering.

James E. Ferris, manager of sales for Niagara Alkali Co. prior to its merger into Hooker, is now product manager of inorganic chemicals. Mr.

Ferris has been continuously employed in sales since 1930. He first came to Niagara Alkali as a chemist in 1926 after graduation from Northeastern University, Boston, where he received the degree of bachelor of chemical engineering.

Stanley A. Mattison, now product supervisor of trichlorethylene sales, was graduated from Syracuse University in 1935 as a chemical engineer, and received the master's degree from Columbia University. In 1946 he joined Niagara Alkali Co. as a member of the sales force.

Matthew F. McCombs has now been appointed product supervisor of potash chemicals. Mr. McCombs has spent the major portion of his thirty years with Niagara Alkali in sales where he had been manager of chloralkali sales.

Joseph E. Thornberg, newly-appointed market analyst, has been with Hooker since 1943 in operations, process study, and in technical sales service since September 1953. Mr. Thornberg is a graduate of Northeastern University with the degree of bachelor of science in chemical engineering.

Kelite Announces Appointments

Charles N. Chalfant has been appointed district sales manager in the New York District for *Kelite Corp.*, manufacturers of industrial chemicals and steam cleaning equipment.

Mr. Chalfant was formerly associated with Hanson-Van Winkle-Munning as manager of industrial cleaner sales.

Robert J. Racine has been appointed

Charles N. Chalfant

Robert J. Racine

Western regional sales manager. He was formerly associated with Wyandotte Chemicals Corp. as manager of industrial sales. Mr. Racine's background includes field sales experience and technical service in the metal industries.

Mr. Racine is active in the American Electroplaters' Society, of which he has been secretary-treasurer and first vice-president of the Detroit

Branch. He is also a member of the American Society for Testing Materials, and the American Ordnance Association.

Pennsalt Expands Detroit Metal Processing Sales Staff

Richard H. Kline has been added to the *Pennsylvania Salt Mfg. Co.'s* Metal Processing Department sales staff in Detroit.

Following technical training at the company's Whitemarsh Research Laboratories, Mr. Kline will work under the direction of district sales manager *Charles R. Sorber*, handling the firm's products for the metal producing and metal working industries in the Detroit area.

A resident of Oak Park, Mich., Mr. Kline attended Michigan State and Wayne Universities and was employed by the Sun Oil Co. as a salesman prior to his present assignment.

Almco Announces New, Enlarged Barrel Finishing Laboratory

Almco Division, Queen Stove Works, Inc., announces completion of what is believed to be the world's most complete barrel finishing research and development laboratory located at Albert Lea, Minn.

Purpose of the laboratory is twofold. First, it offers the metal-working industry the most modern facility for determining, without obligation, the most effective deburring and finishing methods for all types of parts. Sample processing of actual parts will be offered free of charge to manufacturers.

View of main bay of barrel finishing research and development laboratory at Almco Division, Queen Stove Works, Inc., Albert Lea, Minnesota.

Second, it provides the industry with latest machines and equipment for advancement of barrel finishing research.

This new laboratory features three major types of barrel finishing machines. These types are: standard machines, "submerged" units, and fixture equipment of varied barrel diameters and lengths. Dimensions, diameters and lengths, respectively, include five fixture machines (three 40″ x 48″, one 30″ x 32″ and one 48″ x 48″) — and seven standard machines (two 30″ x 32″, one 30″ x 48″, one 22″ x 24″, two 8″ x 16″ twin barrels, and one 14″ x 20″ twin barrel). The new laboratory also includes a six-station Sub-O-Matic "Submerged" System. Three twin barrel machines—two having 8″ x 16″ drums and one 14″ x 20″ drum.

Methods and process engineers who visit the lab can see their parts sample processed in the same type of equipment which would be applied to barrel finishing on a plant production basis. The most modern testing and examination instruments are available.

The new laboratory is the central facility for the Almco engineering organization which includes other barrel finishing laboratories and sales offices in Detroit, Los Angeles, Newark, New Haven, and Philadelphia. Recently, plans were completed for a barrel finishing laboratory in London, Eng.

Three Promoted at Hooker Area Sales Offices

Three promotions have been announced at area chemical sales offices of *Hooker Electrochemical Co. John K. Gallagher* has been appointed district sales manager for California, *Neil M. Barber* is now Philadelphia district sales manager, and *H. McIntosh Beatty, Jr.* has been appointed technical service representative at Tacoma, Wash.

Mr. Gallagher, a resident of Long Beach, Calif., has worked in the firm's sales department since 1941. He is a graduate of the University of California at Los Angeles, and served for three years in the U. S. Navy. In 1939-40 he was employed as a chemist in operations at West End Chemical Co., and the following year was aquatics director for the city of Long Beach. Mr. Gallagher is a past president of the Chemical Market Research Assn. of Southern California.

Mr. Barber, a resident of Wynnewood, Pa., received a bachelor of arts degree from Dartmouth College in 1942. Since then he has been with the company for three years in production of chemicals in connection with the Manhattan Project, and since 1945 as a sales representative.

Mr. Beatty, a native of Cleveland, Ohio, started with the firm in November 1955, and transferred to the sales department last March. In 1953 he was

graduated from Yale University, receiving a bachelor of science degree. For two and a half years following, he served in the U. S. Marine Corps, achieving the rank of First Lieutenant.

West End and Stauffer Announce Merger Plan

West End Chemical Co. and *Stauffer Chemical Co.* announce that their boards of directors have met and both boards have approved a plan of merger of West End into Stauffer. It is expected that the formal merger agreement will be adopted by both boards in the near future and will be submitted to the stockholders of both companies for approval.

West End produces borax, soda ash, salt cake, and lime at its plant at Searles Lake, Cal. For more than twenty-five years Stauffer has been the exclusive sales agent for West End's borax. West End will continue to operate as an autonomous division of Stauffer under the designation of West End Chem. Co. Division of Stauffer Chem. Co.

Jones Appointed Sales Manager at Pioneer Rubber Co.

John R. Jones

John R. Jones has been appointed sales manager of *The Pioneer Rubber Co.* He was formerly field sales manager of the Sundries Div., B. F. Goodrich Co., Akron, Ohio, where he had 27 years of service.

Raybestos-Manhattan (Canada) Ltd. Appointments

Raybestos-Manhattan (Canada) Ltd. has announced the following executive appointments: *J. Stewart Munro,* to president of the company and *Douglas Pocock* to the newly-created post of vice president, replacement sales.

Mr. Munro joined the firm in 1941 as plant engineer and has advanced through many important positions including those as chief engineer, assistant general manager and vice president. As president, Mr. Munro succeeds *Robert Abbott* who, although in retirement, will remain as a Canadian director of the company.

Mr. Pocock, one of the best known men in the automotive service field, joined the company in 1920, and has held the post of sales manager since 1940.

Minnesota Mining Announces Promotions

Maynard H. Patterson and *Kenneth J. Shea* have been promoted to new positions in the international operations of *Minnesota Mining & Mfg. Co.*

Patterson was named vice-president and general manager of the International division and will be responsible for the over-all operation of 3M's activities outside the United States.

For the past five years he has been vice-president and general manager of Minnesota Mining & Mfg. of Canada, Ltd., London, Ontario, a 3M subsidiary. He joined the Durex Corp. in 1946 as an engineer and was assistant general manager of Canadian Durex Abrasives Ltd. when it was dissolved in 1951 and organized as a 3M subsidiary.

Shea was promoted to vice-president and general manager of 3M's Canadian subsidary. Since 1954 he has been vice-president and general sales manager of the International division.

He joined 3M in 1923 and was made St. Paul division sales manager in 1929. In 1935 he was appointed Detroit division sales manager for coated abrasives, adhesives, cellophane and masking tape. He returned to St. Paul in 1946 and headed automotive refinish trade sales in the coated abrasives division for eight years.

OBITUARY

L. D. COOK

The worst airline disaster in the history of commercial aviation, the mid-air collision between a TWA Super Constellation and a UAL DC-7 which claimed 128 lives on Saturday, June 30, brought to a tragic end the career of *L. D. Cook*, sales engineer with the *Bart Mfg. Corp.* On business in the Los Angeles area, Cook was aboard the United Airlines' DC-7 enroute to his firm's Detroit office to wind up his affairs, prior to going on vacation.

Formerly head materials engineer with *Wyandotte Chemicals Corp.*, Cook was acknowledged by fellow engineers to be an expert in the fields of corrosion and product contamination control. His contributions in these fields include extensive work as technical consultant on materials of construction

L. D. Cook

for major chemical equipment used in production processes.

One of the organizers and founders of the Detroit section of the National Association of Corrosion Engineers, Mr. Cook had been a licensed professional engineer in the state of Illinois, and a member of the American Chemical Society, American Society for Metals, and A.S.T.M.

Surviving are his wife Dorothy, and three children, David Jr., 14, Raymond, 12, and Susan, 8, who reside at 8668 Kenberton, Oak Park, Mich.

News from California

By Fred A. Herr

Rheem Automotive Co., which in July was nearing completion on the job of moving its manufacturing and metal finishing facilities from Vernon, Calif., to a new $7,000,000 factory in Fullerton, Calif., will have a completely new and modernized plating system for automotive bumper production. While actually semi-automatic, the plating lines will use complete automatic handling of bumpers in some phases of the operation and direct manual control of other phases.

The pre-plating cleaner line is serviced by an automatic monorail system. Power is supplied by eight 3,000-amp. generators and twelve 15,000-amp. rectifiers.

Following the cleaning cycle, bumpers are processed through one of two parallel nickel plating lines. Each nickel line has semi-bright as well as bright nickel tanks, allowing for the duplex plating operation used in the plant. The nickel tanks are each of 3,700 gallon capacity.

The bumpers next are fed through the nickel buffing department, where tandem buffing machines are set up for some of the bumpers which are buffed prior to final chromium plating.

The chromium plating line consists of ten tanks for cleaning, rinsing, and plating. The tanks are served by two 20,000-amp. rectifiers and one 5,000-amp. generator. From the chromium line, the bumpers are conveyed to a spray booth where the backs are aluminum sprayed for protection.

The plating equipment includes an installation for purifying the nickel solutions. This includes four storage tanks of 2,500 gallon capacity, two 32-inch plate and frame filter presses, and two purification tanks for the semi-bright solutions.

The chromium buffing installation includes two straight line polishing lines, each with 18 polishing heads, a dial polishing line using 32 polishing heads, and a hand polishing line which utilizes six tandem head machines.

Linde Air Products, a division of Union Carbide and Carbon Corp., recently established flame-plating facilities at 2035 E. 52nd St., Los Angeles, making that comparatively new metal working process directly available to industry in the West for the first time. Flame-plating work for western concerns heretofore was performed at the company plant in Indianapolis, Ind. The flame-plating process involves a surfacing method in which particles of tungsten carbide are literally blasted at supersonic speed onto the surface of a workpiece to produce a hard, wear-resistant coating.

The Carborundum Co. has announced plans for a new western plant for silicon carbide production at Vancouver, Wash. The plans include extension of an existing silicon carbide furnace plant by 150 feet and additions to the present battery of furnaces. The expansion is made necessary, it was announced, to meet increased demand for silicon carbon used in the manufacture of grinding wheels, coated abrasives, super refractories and metal additives.

Speed-D-Burr Corp., of Glendale, Calif., manufacturer of barrel finishing equipment, has announced that plans have been completed for a new manufacturing plant costing approximately $250,000 in the Lomita and South Main Sts. area of Los Angeles. Construction was due to start in late summer. Plans call for triple the firm's current manufacturing space. A modern barrel finishing laboratory for experimental, customer service, and planned research into barrel finishing problems is included in the plans. The present plant at 3613 San Fernando Road, Glendale, Calif. will continue to operate for service to the plating and finishing industry in the northern and western areas of Southern California.

The Norton Co. of Worcester, Mass., abrasive manufacturers, has appointed *Gordon F. Colson* as field engineer at the firm's Huntington Park, Calif., office. Colson previously served in a similar capacity in the Chicago, Ill., office.

Another appointment to the Norton Western staff involves the assignment of *J. A. Heath* to the sales and service staff in the Los Angeles area.

Ernest M. Wheeler has been added to the sales staff as a technical engineer for Fabriform Metal Products, Los Angeles, a division of the George Getz Corp. Wheeler formerly was engaged in analytical and service laboratory work for MacDermid, Inc., Waterbury, Conn.

An industrial process involving developments in the missiles field has become the focus of a legal battle with the filing of a suit in Superior Court in Los Angeles by Electrofilm, Inc., North Hollywood, Calif., against

Therm-O-Lab Corp., also of North Hollywood.

Electrofilm, which has been active in the production of film type electric area heating elements since 1949, contends that an invention by a Ralph Hall has been appropriated and used by Therm-O-Lab Corp. Heater units of this type are said to play an important role in missiles technology because of their compactness, light weight, ability to withstand vibration and high G's. Rights to the invention, involving use of a ceramic ingredient, are claimed by Electrofilm, on the basis of its original contract with the inventor. *A. R. Booker*, formerly general manager of Electrofilm and now president of Therm-O-Lab, who is charged by the complainant of a conspiracy to obtain and use the invention.

The suit seeks an accounting and recovery of profits made by Thermo-O-Lab, punitive damages against Booker, and a court order to turn over and surrender claim to the process extension.

Further details released concerning Kaiser Steel Co.'s plans for a $113 million dollar expansion at its Fontana, Calif. plant, disclosed that the program will include the installation of a second electrolytic tin finishing line which will increase the output of tin plate by 80% to supplement the first 100-foot-long tin plating line installed at Fontana three years ago.

Other major units to be installed under the huge expansion program include two 65 ton oxygen converter vessels (the first oxygen process in the West); a new slabbing mill, new temper mill, new continuous strip pickler, and additions to the hot strip, plate and tin mills.

Upon completion of the program, Kaiser-Fontana will have facilities for producing and processing 450,000 more tons of steel. The hot strip and plate line is expected to be completed by January 31, 1957; the slabbing mill by September 1957, the charge soaking pits by May 1957, oxygen converter September 1957. Completion of the entire program is looked for by April 1958.

E. William Eipper has been named director of the market development department of Stauffer Chemical Co., with headquarters in San Francisco. He joined the organization as Western manager in 1954.

Stauffer Chemical Co., whose headquarters are in New York, has announced plans for construction of a $2,000,000 plant for production of sulfuric acid at Dominquez, Calif., ten miles south of downtown Los Angeles. Construction was due to get underway in August with completion anticipated by February 1957.

The Third Annual Regional Conference of the American Society for Quality Control is scheduled to be held at Hotel Statler, Los Angeles, Calif., August 20 and 21.

Representatives of a wide variety of industries including those concerned with metal fabrication, processing and finishing, are expected to attend the sessions at which emphasis is to be placed on vendor-consumer relationships in industry, and ways and means for supplying quality production at satisfying cost to firms engaged in aircraft, electronics and other industries. Program Chairman *Harry G. Romig* has announced that the primary objectives of the conference will be to acquaint industry and the public with fundamentals of quality control and to conduct technical sessions for the presentation of papers on basic and advanced techniques of quality control.

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750/375	6/12	Excel
940	32	Elec. Prod.
1500	15	Star
1500	30/50	Century
1500	40/65	G. E.
1500	65	Westinghouse
1500	70	Century
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1—2500/1250 Ampere, 9/18 Volt, Electric Products, Synch., Exc.-in-head. 25°C.
1—2000/1000 Ampere, 6/12 volt, Hanson-Van Winkle-Munning.
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1—1500/750 Ampere, 12/24 volt, Chandeysson, Synch., Exc.-in-head.
1—1000/500 Ampere, 6/12 Volt, Electric Products.

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SITUATION OPEN—Opening with one of the Nation's leading firms who are engineers and manufacturers of electroplating equipment and supplies. We need a graduate chemist who has background in metal finishing with experience in aluminum. Opportunities are good, employee benefits are numerous, working conditions excellent. Forward resume. Address: July 7, care Metal Finishing, 381 Broadway, Westwood, N. J.

PLATING FOREMAN

SITUATION OPEN — Plating foreman wanted for modern plant. Production chrome plating, brass and zinc die casting. Write giving detailed experience.

Personnel Manager
EMPIRE BRASS MFG. CO. LIMITED
London, Ontario, Canada

BUFF SALESMAN — AGENT

SITUATION OPEN — Salesman — agent — for our competitive line. Some excellent territory open. Satisfactory salary or commission arrangements will be made.

AMATEX BUFF COMPANY
28 W. Third St. New York 12, N. Y.

PLATER

SITUATION OPEN—Florida calling. Plater wanted with job shop experience in silver and gold. State experience and salary desired. Address: August 4, care Metal Finishing, 381 Broadway, Westwood, N. J.

SITUATIONS WANTED

ELECTROPLATING CHEMIST

SITUATION WANTED—18 years experience in all types of electroplating, anodizing, conversion coatings and extensive research, development, production trouble-shooting, schedules and installations. Work also includes production process development, preparation of process specifications, customer and technical service, supervision of metal finishing and analytical laboratory personnel. B. S. Degree. Address: August 2, care Metal Finishing, 381 Broadway, Westwood, N. J.

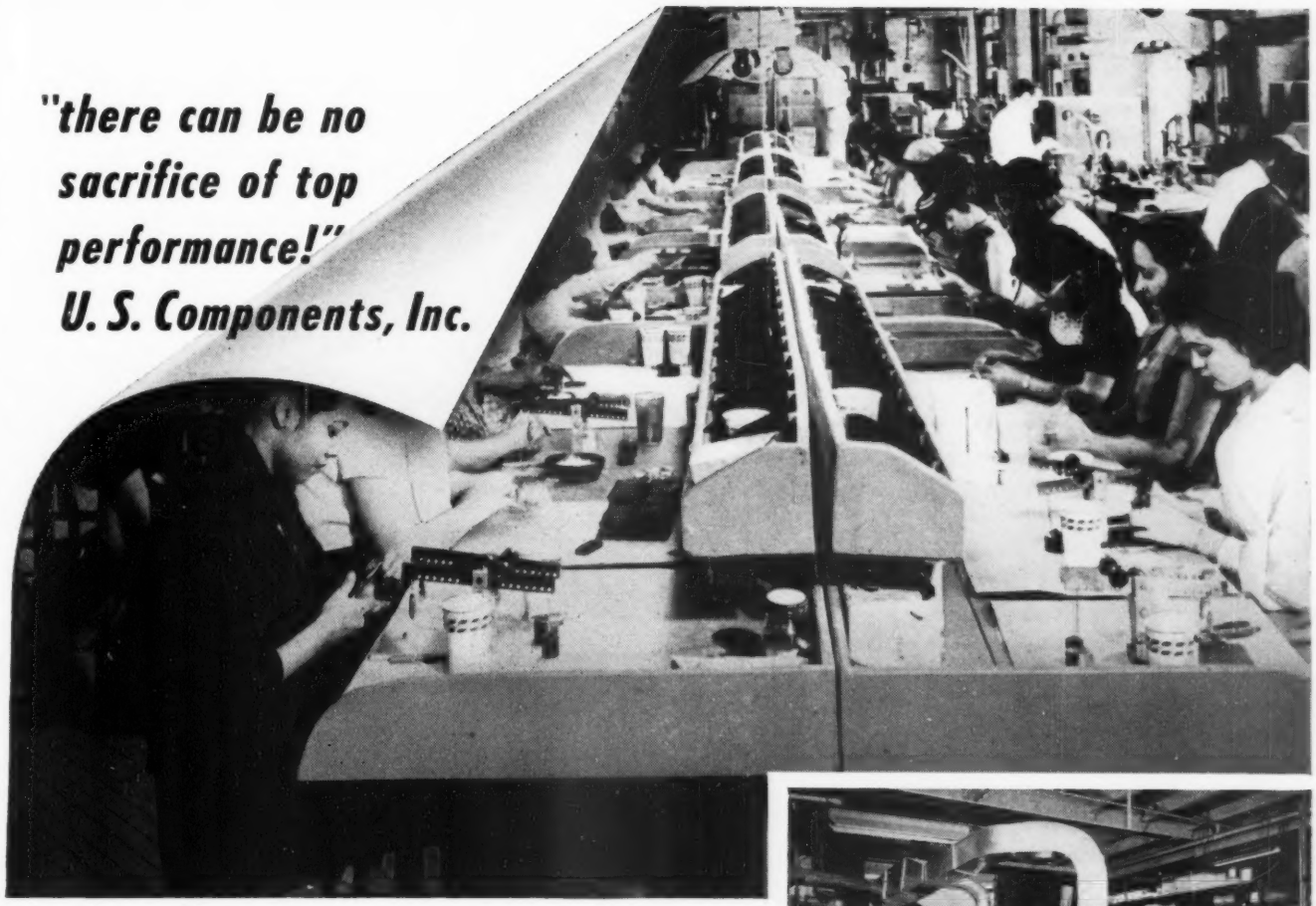
METAL FINISHING AND QUALITY CONTROL SUPERVISOR

SITUATION WANTED—Available July 1, 1956. 13 years experience in metal finishing supervision, polishing, chrome nickel, copper, silver, zinc, etc. 7 years quality control inspection supervision on complex items. Make up and control solutions. Age 40, married, two children. Address: July 8, care Metal Finishing, 381 Broadway, Westwood, N. J.

PLATING ENGINEER

SITUATION WANTED—Well qualified plating engineer, offering twenty years diversified experience in electroplating. Now managing small manufacturing and sales company. Thoroughly experienced in sales, research, design, and supervision. Forty years old, married, free to travel. Address: April 5, care Metal Finishing, 381 Broadway, Westwood, N. J.

SUPPLIERS OF EQUIPMENT AND MATERIALS AND ADVERTISERS INDEX



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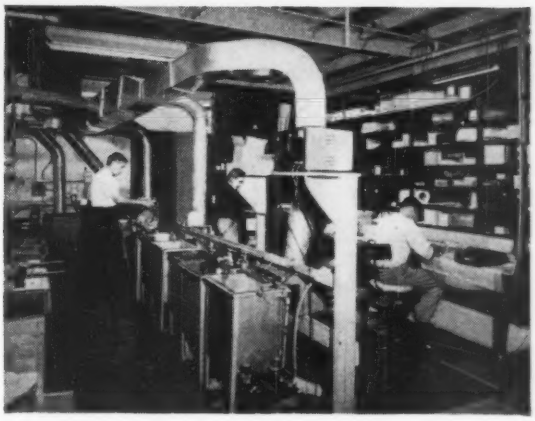
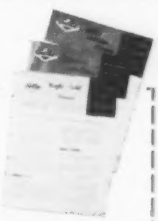


Above photograph shows a section of the Sel-Rex engineered gold and silver plating department of U.S. Components, Inc., New York City. U.S. Components, Inc. is one of the leading producers of quality controlled components for manufacturers of communications, computers, aircraft, guided missiles, portable equipment, instrumentation, and test apparatus.

Sel-Rex BRIGHT PRECIOUS METALS PROCESSES have unique features which make them ideally suited for the exacting requirements of electronic and electrical industries. Sel-Rex BRIGHT GOLD is particularly desirable because it produces a mirror-bright finish directly from the bath—regardless of thickness requirements. Economical, too, for one gram does the job of 2 grams of conventional 24K gold.

Among the many advantages of Sel-Rex BRIGHT RHODIUM is its unmatched purity—actually plates bright longer than other rhodium processes.

EXTRA — Sel-Rex offers A.S.C.—Automatic Stress Compensation — a special technique which counteracts the high stress characteristics inherent in precious metals plating.



Sel-Rex Precious Metals, Inc.
Dept. MF-8, 229 Main St.,
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Please rush descriptive literature and technical data on Sel-Rex PRECIOUS METALS PROCESSES.

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Company_____

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Manufacturers of Sel-Rex BRIGHT GOLD • RHODIUM • SILVER

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. . . with Mac Dermid's METEX STRIP AID!

You strip nickel, brass, copper, zinc, cadmium or tin from ferrous metals safely, quickly and at low cost with METEX STRIP AID.

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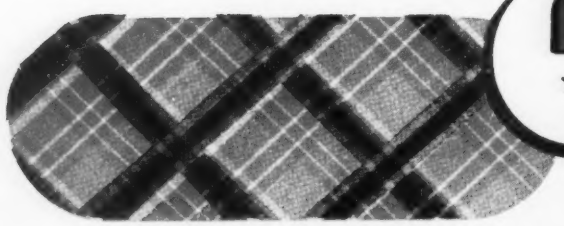
Immerse a ferrous metal part in METEX STRIP AID . . .

Leave it as long as you want—even overnight!

The result: no attack . . . base metal's good as new!

METEX STRIP AID is water-soluble and may be used either hot or cold. No current needed . . . parts may be cleaned or replated with no loss of lustre on the base metal. Work can be stripped in bulk, barrels or on racks.

Write Mac Dermid for more information. Let a Mac Dermid representative show you the *safe way* to strip ferrous metals.



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